

SCIENTIFIC AMERICAN

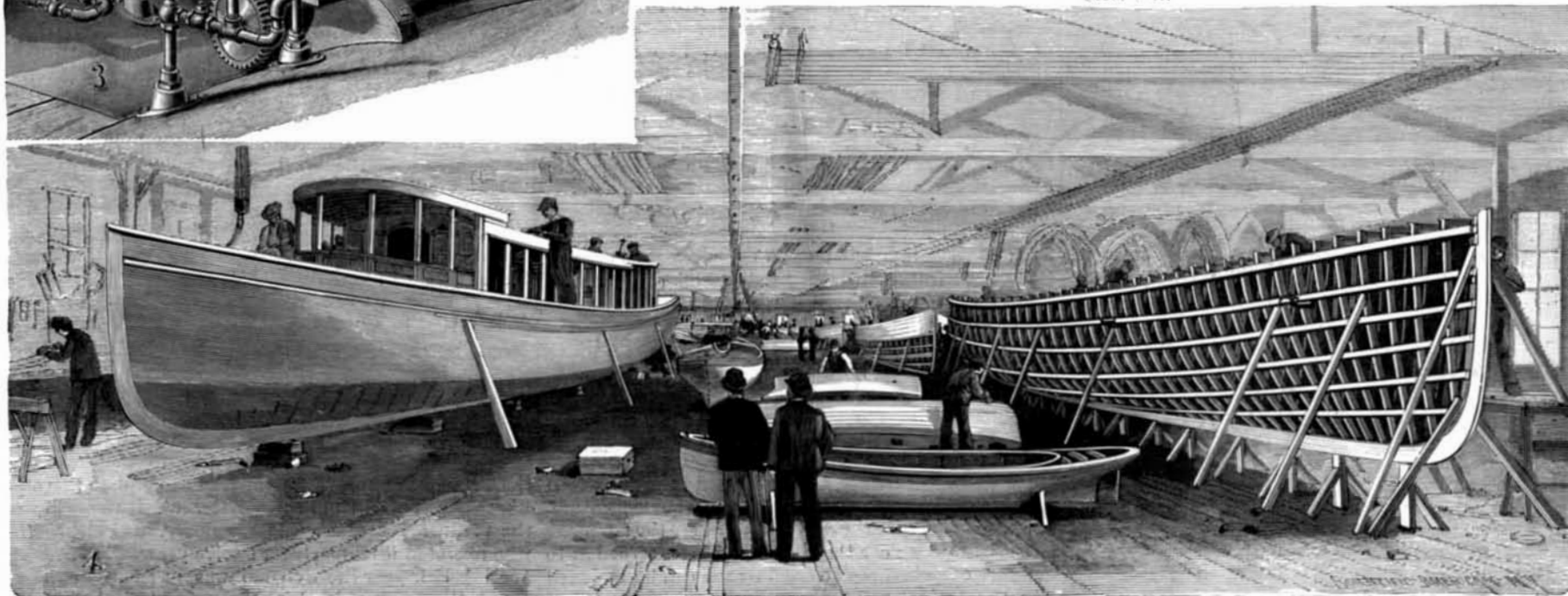
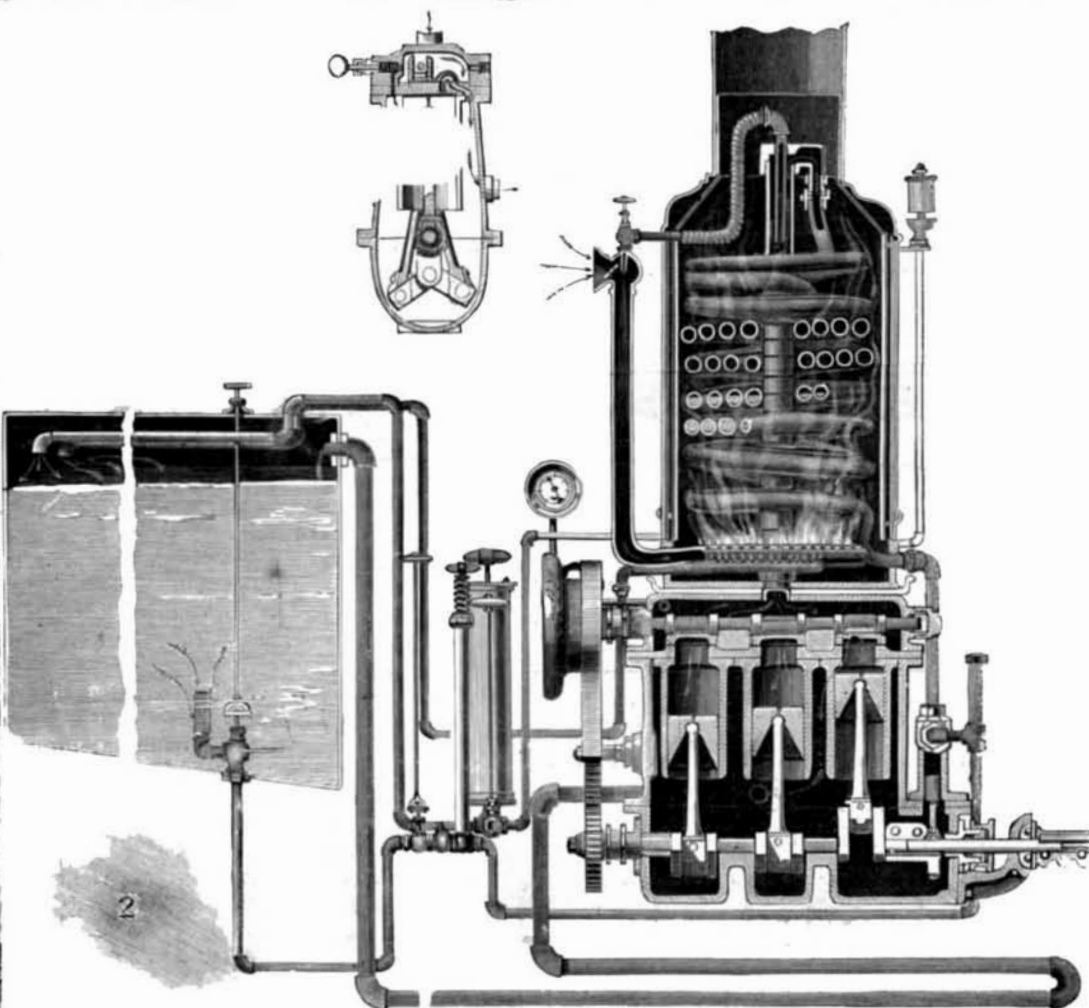
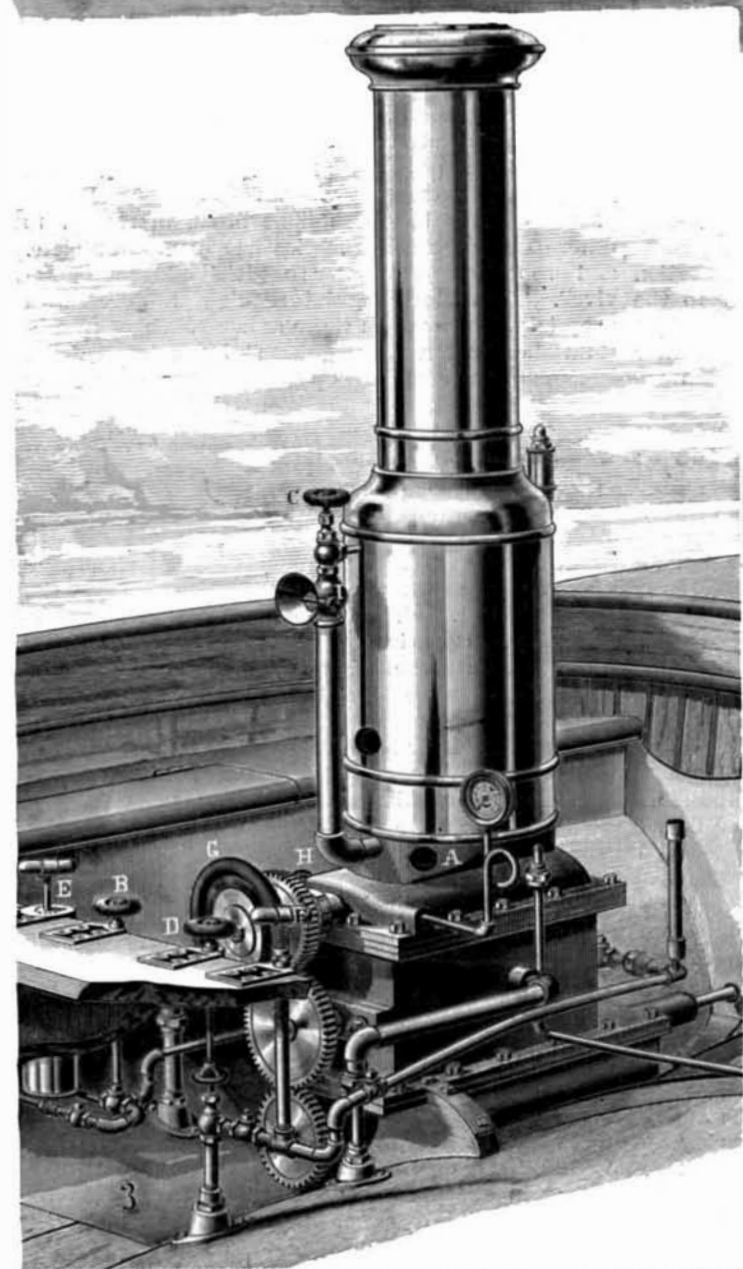
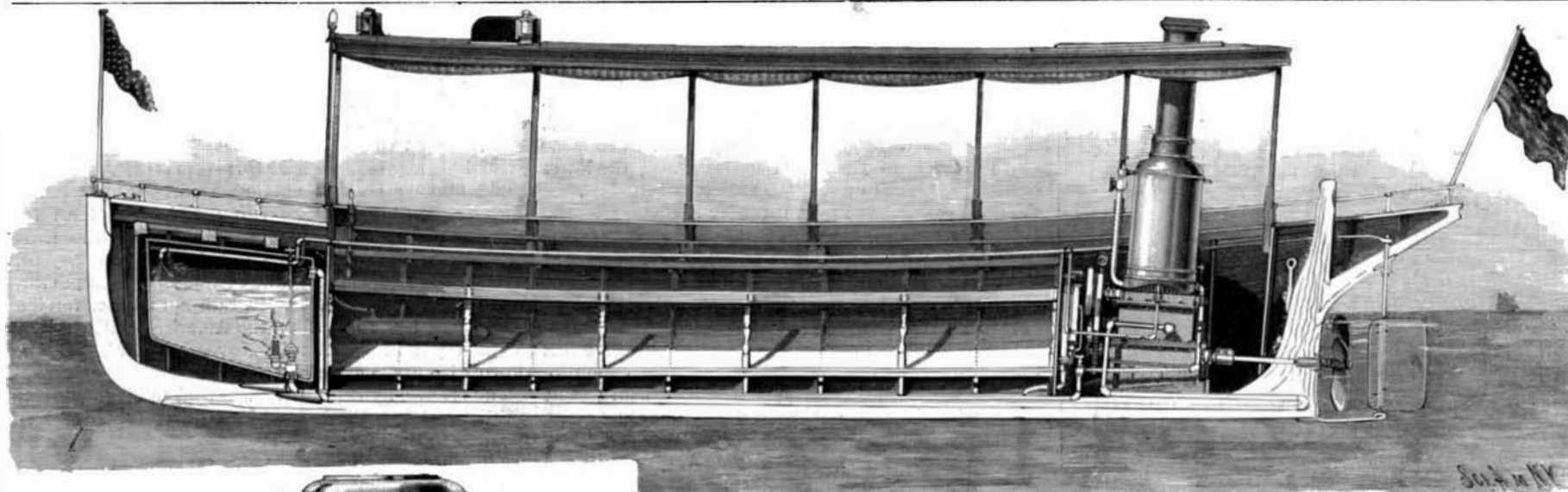
[Entered at the Post Office of New York, N. Y., as Second Class matter. Copyright, 1895, by Munn & Co.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXXII.—No. 11.
ESTABLISHED 1845.

NEW YORK, MARCH 16, 1895

(\$3.00 A YEAR.
WEEKLY.



1. Longitudinal section of launch. 2. Cross section of boiler and engine. 3. Perspective view of the engine. 4. General view of the building shop.

THE MANUFACTURE OF NAPHTHA LAUNCHES BY THE GAS ENGINE AND POWER COMPANY —[See page 167.]

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN.

A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S., Canada or Mexico.....\$3 00
 One copy, six months, for the U. S., Canada or Mexico.....1 50
 One copy, one year, for any foreign country belonging to Postal Union.....4 00
 Remit by postal or express money order, or by bank draft or check.
 MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, \$5.00 a year, for the U. S., Canada or Mexico. \$6.00 a year to foreign countries belonging to the Postal Union. Single copies 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page.
Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to one address in U. S., Canada or Mexico, on receipt of seven dollars. To foreign countries within Postal Union eight dollars and fifty cents a year.

Building Edition.

THE ARCHITECTS AND BUILDERS EDITION OF THE SCIENTIFIC AMERICAN is a large and splendid illustrated periodical, issued monthly, containing floor plans, perspective views, and sheets of constructive details, pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To builders and all who contemplate building this work is invaluable. Has the largest circulation of any architectural publication in the world.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, \$2.50 a year. To foreign Postal Union countries, \$3.00 a year. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, to one address, \$5.00 a year. To foreign Postal Union countries, \$6.50 a year. Combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, \$9.00 a year. To foreign Postal Union countries, \$11.00 a year.

Export Edition of the Scientific American.

In which is incorporated "LA AMERICA CIENTIFICA E INDUSTRIAL," or Spanish edition of the SCIENTIFIC AMERICAN, published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number contains about 50 pages, profusely illustrated. It is the finest scientific, industrial export paper published. It circulates throughout Cuba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. THE SCIENTIFIC AMERICAN EXPORT EDITION has a large guaranteed circulation in all commercial places throughout the world. \$3.00 a year, post paid to any part of the world. Single copies 25 cents.

Manufacturers and others who desire to secure foreign trade, may have large and handsomely displayed announcements published in this edition at a very moderate cost. MUNN & CO., Publishers, 361 Broadway, New York.

The safest way to remit is by postal order, express money order, draft or bank check. Make all remittances payable to order of MUNN & CO. Readers are specially requested to notify the publishers in case of any failure, delay, or irregularity in receipt of papers.

NEW YORK, SATURDAY, MARCH 16, 1895.

Contents.

(Illustrated articles are marked with an asterisk.)

Agricultural machines wanted.....	164	Glass, American plate, manufac-.....	167
Apoplexy.....	172	Cure.....	167
Arts and time, new.....	165	Gold production, South Africa.....	166
Astronomical programme, 1895.....	172	Hotels in East India.....	167
Atlanta Exposition, the.....	165	Injector, the International.....	171
Auto-phoro-optometer, the.....	171	Inventions, recently patented.....	173
Birds of the Congo.....	169	Machine, arc light, Brush's first.....	162
Bolt cutter, a large size.....	169	Mexicans, ancient, books of.....	166
Bridge, proposed suspension.....	168	Naphthyls launched.....	162, 167
N. Y.....	168	Notes and queries.....	173
Car coupling, Morton's.....	164	Patent decision, important.....	162
Chair, adjustable, Evers's.....	164	Patents granted, weekly record.....	173
Charcoal and products.....	163	Phosphate industry of the South.....	167
Cheese, Camembert.....	172	Railway speeds, high.....	163
Coast of U. S., guarding the.....	163	Railway, the.....	163
Columbian Exposition awards.....	171	Railway, Sir Henry.....	163
Compressed air for street cars.....	170	Selenite, cheap substitute for.....	170
Corn harvester, Low's and Mes-.....	164	Siam, the late crown prince of.....	166
seenger's.....	164	Silk industry, the, Syria.....	165
Disinfectant.....	167	Soap and washing compounds.....	164
Drops of liquids to centimeter.....	167	Tar, useful products from.....	165
Electric storage battery traction.....	167	Vire, Van Wegen's balance.....	164
Paris.....	167	Whalebone, artificial.....	167
		Wire rope tramway, Gibraltar.....	163

TABLE OF CONTENTS OF SCIENTIFIC AMERICAN SUPPLEMENT No. 1002.

For the Week Ending March 16, 1895.

Price 10 cents. For sale by all newsdealers.

I. ARCHITECTURE.—The New Theater San Luis de Potosi, Mexico.—A beautiful building by a distinguished Mexican architect.—1 illustration.....	16015
Wind Pressures on Buildings.—Experiments on wind pressure, with special regard to the requirements of the architect and builder.....	16014
II. CHEMISTRY.—Argon, the New Constituent of the Atmosphere.—XIV.—General Conclusions.—Further abstract of Professor Rayleigh's exhaustive paper on the newly discovered element.....	16016
Explosives and their Modern Development.—By Professor VIVIAN B. LEWES.—Lecture II continued.—Continuation of Professor Lewes' lecture, treating especially of nitroglycerine.....	16015
III. EDUCATION.—The Tanning School of Saxony.—A school of technical education at Freiberg, Saxony.....	16008
IV. ELECTRICAL ENGINEERING.—How Shall the Trolley be Applied on Steam Roads?—A symposium on this subject, now increasing in interest.....	16008
V. ELECTRICITY.—Electric Discharge Through Gases.—By Professor J. J. THOMSON.—A recent Royal Institution lecture, with elaborate experiments.—6 illustrations.....	16010
Electricity for Mechanics.—By GEORGE CUTTER.—A very popular paper on the generalities of electricity, with analogies.—8 illustrations.....	16011
VI. MECHANICAL ENGINEERING.—Circular Saw for Cutting Bars, etc.—A machine for use in boiler shops for cutting stays and bars.—1 illustration.....	16014
VII. MEDICAL AND HYGIENE.—The Influence of the Bicycle in Health and in Disease.—By GRAEME M. HAMMOND, M.D.—A valuable paper by a distinguished specialist on a subject of widespread interest.....	16018
VIII. MISCELLANEOUS.—The Fall of Port Arthur.—View of Port Arthur and notes on its attack and capture.—1 illustration.....	16007
IX. METALLURGY.—Note on a modification of the open hearth steel process.....	16008
X. NATURAL HISTORY.—The Smallest Flying Squirrel.—By R. LYDEKKER.—A most interesting little mammal, with illustration of a unique specimen in the Berlin Museum.—1 illustration.....	16021
XI. NAVAL ENGINEERING.—A German Ice Breaking Machine.—A simple and efficient apparatus for breaking through ice on rivers and harbors.—1 illustration.....	16014
The Elbe Disaster.—Notes of the disaster, with view of the Crathie after the collision.—1 illustration.....	16012
The Light Draught French Gunboat Precieuse.—A stern wheel gunboat for use in Madagascar.—1 illustration.....	16012
XII. ORNITHOLOGY.—Curious Habits of Birds.—A popular paper on the peculiar habits of the feathered tribe.....	16019
XIII. PATENTS.—Number and Subjects of American Patents.—A table of interest to inventors and others, giving a complete subject list of American patents.....	16008
XIV. PHYSICS.—On the Spectra of Argon.—An abstract of a paper by Prof. CROOKES on the spectra of argon.....	16017
The Liquefaction and Solidification of Argon.—An interesting series of experiments on the thermic relations of argon, with exhaustive table.....	16017
XV. TECHNOLOGY.—Leblanc's Compound Sugar Mill.—An improvement in the direction of the higher efficiency in the sugar cane rolling mill.—2 illustrations.....	16013
Rotary Bottling Machine.—An improved apparatus for bottling wine.—3 illustrations.....	16012
The Basketware Industry of Upper Franconia.—A curious house industry, confined to a restricted region.....	16007
XVI. TELEPHONY.—The Theatrophone.—Application of the telephone in Paris to distributing the performance of plays and operas.—5 illustrations.....	16009

AN IMPORTANT PATENT DECISION BY THE SUPREME COURT.

Section 4887 of the Revised Statutes of the United States, relating to patents, contains the following provision: "Every patent granted for an invention which has been previously patented in a foreign country shall be so limited as to expire at the same time with the foreign patent, or, if there be more than one, at the same time with the one having the shortest term, and in no case shall it be in force more than seventeen years."

In some countries, as, for example, Great Britain, the life of a patent is 14 years; if therefore an invention is first patented there, and afterward patented here, the American patent will only run for 14 years. The term of the American patent is thus reduced by three years, simply because the foreign patent was taken out prior to the American patent. There is no important reason why the American patent should be thus shortened, and it seems to be a palpable injustice; but such is the plain provision of the American law, and the lower courts have always upheld the validity of the law.

Various efforts have been made by interested parties to procure decisions holding the meaning of the statute to be that when patents are granted in foreign countries prior to the filing of the application for the American patent, such American patents should expire with the shortest foreign patent.

The lower courts have invariably refused to give this interpretation to the statute; they held to the provision of the text, namely, that the American patent expired with the term of the shortest foreign patent.

The question has now been, for the first time, authoritatively settled by the Supreme Court of the United States, the case being that of the Bate Refrigerating Company, appellant, vs. Sulzberger. Bate applied for his American patent December 1, 1876, and it was granted in November, 1877. But prior to the issue of this patent he took a Canadian patent (July 9, 1877) for the term of five years; also an English patent (January 29, 1877).

The decision of the Supreme Court was delivered by Judge Harlan, on March 4, 1895.

"We cannot," says the Court, "superadd in Section 4,887 of the Revised Statutes the words 'prior to the application' either after the words 'first patented or caused to be patented in a foreign country,' or after the words 'previously patented in a foreign country,' without deviating from the intention of Congress as manifested by the language it selected to indicate its purpose. And the express command of the existing statute is that every American patent for an invention 'previously patented in a foreign country,' that is, 'first patented or caused to be patented in a foreign country,' shall expire at the same time as the foreign patent. No words are used that will justify the Court in holding that an invention patented in a foreign country before being patented here is to be exempt from the operation of the provision limiting the term of the American patent to expire with the foreign patent."

"Was the Bate invention patented abroad before it was patented in this country? If so, the American patent expired with the foreign patent, and therefore the American public became entitled to use the invention from the time the foreign public were permitted to use it. Congress in effect by the existing law says to the inventor in order to enjoy the exclusive use in this country of his invention for the term prescribed by law, 'if your invention has not been introduced into public use for more than two years you may, upon complying with the conditions prescribed, obtain an American patent, and you may, if you can, obtain a foreign patent. But the American patent will be granted on the condition that if you obtain a foreign patent first your invention shall be free to the American people whenever by reason of the expiration of the foreign patent it becomes free to people abroad; but in no case shall the term of the American patent exceed seventeen years.' This we deem to be a sound interpretation of the statute giving to the words used the meaning required by their ordinary signification. In our judgment the language used is so plain and unambiguous that a refusal to recognize its natural meaning would be justly regarded as indicating a purpose to change the law by judicial action based upon the supposed policy of Congress. But as this court well said in Haddon vs. Collector, 5 Wall. 107: 'What is termed the policy of the government with reference to any particular legislation is generally a very uncertain thing, upon which all sorts of opinions are founded by different persons. It is a ground much too unstable upon which to rest the judgment of the court in the interpretation of statutes.' 'Where the language of the Act is explicit' this court has said 'there is great danger in departing from the words used to give an effect to the law which may be supposed to be designed by the legislature. . . . It is not for the court to say where the language of the statute is clear that it shall be so construed as to embrace cases because no good reason can be assigned why these were excepted from its provisions.' Denn. vs. Reid, 10 Pet. 524-527.

"Our answers therefore to the questions certified are that the invention for which United States patent to Bate was issued under the facts stated, was 'previously patented in a foreign country,' within the meaning of those words in Section 4,887 of the Revised Statutes, and that the United States patent to him expired under the terms of that section before the expiration of seventeen years from its date."

"Let it be so certified to the Circuit Court of Appeals."

The Bate appeal case was notable for the great array of legal talent on each side.

The General Electric Company, as owners of the Edison electric light patent, and the American Bell Telephone Company, owners of telephone patents, had great interests at stake, and were strongly represented.

Edison's patent for electrical lamps number 223,898, dated January 27, 1880 (application filed November 4, 1879), gave to its owners a virtual monopoly of the great industry of electric lamp manufacture. No one could make an electric lamp without paying tribute. This patent if allowed to run for the full term for which it was granted, namely, seventeen years from its date, would not have expired until January 27, 1897. But prior to the grant of his American patent, to wit, in November, 1879, Mr. Edison obtained foreign patents of less term than the American patent. His English patent expired in November, 1894, carrying down with it the American patent.

The electric light industry was thus made free to the public; yet few will deny that a great injustice has resulted to the inventor. To Thomas Alva Edison we are indebted for the modern electric lamp and the incandescent system of electric lighting. Every electric lamp that gleams in every corner of the world is due to the light of his genius, and he deserves well of all the nations of the earth. Although by the terms of the American statute Edison's patent is cut short, it is still within the power of Congress, makers of the law, to revive and extend the patent for an additional term of years. This has been done often, in respect to other patents, but the practice has become obsolete, and probably it were better that it should not be revived. The national legislature might, however, with propriety, bestow upon Edison some token of a substantial character, in recognition of the incalculable benefits he has conferred upon his native land.

Besides the Edison lamp patent, the hopes of several other holders of important patents are crushed by this decision of the Supreme Court. Among them are the Edison patents of 1892, covering the use of carbon in telephone transmitters; also the Berliner patent, all owned by the American Bell Telephone Company. These patents contain broad and sweeping claims.

The American patents for these inventions were not issued until 1893, although they were applied for some 14 or 15 years previously. Their issue was purposely kept back until the original Bell patent had nearly expired; they were then brought forward with the expectation of perpetuating the Bell telephone monopoly until November 17, 1908. But, as the same inventions were patented in Great Britain and other countries long prior to the issue of the American patents, the latter were null when they were granted, and their issue by our Patent Office was, in the light of the above decision, an error.

The Bell telephone monopoly is now brought to an end, so far as basic patents are concerned; and we may soon look for great improvements if not for a complete revolution in the art of electric communication throughout the country. At present it is much more expensive to communicate by telephone with distant places than it is to send telegraphic messages, but the latter consume much more time. For example, our experience is that it generally requires three hours or more to send a telegraphic message from New York to Washington and get a prompt answer back, cost fifty cents; whereas, to convey the same message by telephone and get the answer rarely takes more than ten minutes, but costs \$2.00. The reason of this greater cost is that the Bell Telephone Company is bound by agreement with the Western Union Telegraph Company not to engage in telegraphic business. But this agreement, it is understood, expires this year, and thereafter the Bell Company will be able to throw more fully open to the public its remarkable facilities for telegraphic communication.

Brush's First Arc Light Machine.

At the recent Cleveland Convention the Brush Electric Company had one of the most interesting exhibits. A notable feature of the exhibit was the first arc light dynamo built by Mr. Brush. This is a one light machine, and was built in 1876, at Mr. Brush's residence, and hauled, in the rear of his buggy, to the works of the Telegraph Supply Company, in Champlain Street, where it was set up and run. Later on it was sold to the Viaduct Manufacturing Company, at Baltimore, who operated it regularly for twelve years. During the World's Fair year the dynamo was purchased by the Brush Company and exhibited as a historical relic in Electricity building, where it was shown in operation.

Sir Henry Rawlinson.

Major-General Sir Henry Creswicke Rawlinson died in London March 5. He was born at Chadlington, Oxfordshire, in 1810, and was educated at Ealing School. In 1828 he entered the military service of the East India Company. For six years he served in Bombay and distinguished himself as a sportsman. In 1833 he accomplished the remarkable feat of riding 72 miles in 3 hours 17 minutes. In November of the same year he was sent to Persia, where he held several important positions under the Shah and reorganized the Persian army. As a soldier and diplomat he occupied many important positions with credit to himself and his country; but he owes his fame chiefly to his archaeological researches, which were of pre-eminent importance. Rawlinson and Layard stood at the head of the English school of archaeologists. The light which Rawlinson threw upon the cuneiform inscriptions, the barrier hitherto impassable for all European and Asiatic experts, has justified the title with which he has been honored, of the "Father of Assyriology." His researches on the cuneiform inscriptions began in 1835, and in 1837 he succeeded in copying the first column of the great Behistun inscription, and submitted a report thereon to the Asiatic Society in London, on January 1, 1838. The task of copying the Behistun inscription was one of great danger. The cuneiform characters were inscribed on a cliff over 300 feet from the ground. For support the transcriber had to trust himself to a ladder resting on a ledge about two feet in breadth. In 1843 he again made valuable researches on the inscriptions and in 1844 he completed his work on the Behistun inscription. A few years later he was commissioned by the trustees of the British Museum to superintend the excavations at Nineveh and Babylon. The results of these works were afterward published by him as "Outlines of the History of Assyria as Collected from the Inscriptions Discovered by A. H. Layard in the Ruins of Nineveh" and "On the Inscriptions in Assyria and Babylonia."

Sir Henry Rawlinson received many marks of distinction from the British government and from scientific and literary bodies. The University of Oxford conferred the much-coveted degree of D.C.L. upon him. He was a fellow of the Royal Society, a corresponding member of the French Institute, a trustee of the British Museum, the Royal Asiatic Society and the Royal Geographical Society.

Besides his numerous contributions to the journals of Asiatic societies and the works mentioned above, Sir Henry published "Memorandum on the Publication of the Cuneiform Inscriptions of Western Asia," jointly with George Smith, "A Selection from the Miscellaneous Inscriptions of Assyria," in conjunction with Norris, "The Cuneiform Inscriptions of Western Asia." He also made several contributions to the notes on the translation of Herodotus, published by his brother, the Rev. George Rawlinson. Perhaps his work which is best known to general readers is "England and Russia in the East," a series of papers on the political and geographical condition of Central Asia.

High Railway Speeds.

From an article in the Railroad Gazette we abstract the following: The first famous record of engine 999 was made May 9, 1893, hauling 362,000 pounds of cars and passengers, the engine and tender weighing 204,000 pounds, the total weight of train being 283 short tons. This train ran on that trip 69 miles in 63 minutes, and during this part of the run made 5 miles in $3\frac{1}{2}$ minutes, or at the rate of 85.7 miles an hour on a descending grade of about 20 feet per mile. During the same run one mile was made in 35 seconds, or at the rate of 102.8 miles an hour. The speed was taken between mile posts with a stop watch by the conductor of the train. Mr. William Buchanan, the designer of the engine, who is certainly not a careless man in such matters, accepted this record as accurate. But if there had been an error of a whole second, which might easily have happened, the rate would still have been 100 miles an hour for one mile. We have, therefore, considered it safe to say that this engine has undoubtedly made as fast time as 100 miles an hour for one mile.

Concerning the record of upward of 112 miles an hour we have always had doubts, and yet we have little doubt that that run was made at even a higher speed than the record which we do accept. On May 19, 1893, engine No. 903, of the New York Central, with the same train as was hauled by No. 999, is said to have made five miles on the same ground; that is, on a descending grade of about 20 feet to the mile in three minutes, or at the rate of 100 miles an hour.

Before this time there were five records running from 87.8 miles an hour up to 97.3 on the Philadelphia & Reading and the Central of New Jersey, made in 1890, 1891 and 1892. Three of these records, including the highest one, were made by engine No. 385, a Baldwin four-cylinder compound. There is a circumstantial record of over 85 miles an hour made July 17, 1893, by the compound locomotive No. 680 with a five-car train. A distance of 13.5 miles was run in $9\frac{1}{2}$ minutes, or at 85.25 miles an hour. The grade is broken, but is

descending nearly the whole distance, varying from 6 feet to 37 feet per mile, with a very short bit of rising grade near the end. The times were taken to the nearest half-minute, and they are, therefore, subject to considerable correction, which might easily reduce the average speed to 80 miles. So we do not attach great value to this as an instance of over 84 miles an hour.

There can, however, be no doubt that speeds of over 84 miles an hour are often made by the Philadelphia & Reading and Central New Jersey engines. A practical designer and builder of locomotives in large practice and with a good deal of experience in timing locomotives, says that "between Jersey City and Philadelphia it is a very common occurrence for the engines hauling the Blue Line trains to reach 90 miles an hour, the seconds per mile ranging from 38 to 45. It has been my pleasure to time these engines repeatedly at a rate of 40 seconds a mile, and I have taken indicator diagrams from them at a speed of 92 miles per hour."

Arts and Industries that did not Exist Fifteen Years Ago.

"Right here in the Patent Office you may watch the forward rush of civilization and realize how rapid it is," said Chief Examiner Greely to a writer for the Washington Star. "Probably it has never occurred to you to consider how many arts and industries that are of importance to-day were unknown in 1880. Their creation has given employment to tens of thousands of people and to billions of dollars of capital. If we were thrown back only so far as a decade and a half, we should find ourselves deprived of numerous comforts, and even necessities, as we now regard them, which were not obtainable at all fifteen years ago."

"The self-binding harvester is new since 1880, commercially speaking. It renders possible the gathering of certain cereal crops with a rapidity unapproachable by hand labor. Hundreds of thousands of men would be required to reap the harvests of the great Northwest without the aid of this machine. It has made practicable the raising of crops far larger than could be produced and garnered otherwise. Incidentally food has been cheapened."

"The typewriter was not put on the market until 1883. It seems wonderful that we could have got along at all without it. In eleven years from \$25,000,000 to \$30,000,000 worth of typewriters have been sold. This machine has opened a new field for women's work. It has increased the demand for writers of shorthand very greatly. The quantity of matter actually written has been enormously increased by this invention. It has rendered letter writing so easy that many people now maintain a large correspondence who would write very few letters by longhand. Merchants write more than twice as many letters as they used to, and the volume of the mails has been proportionately augmented."

CABLE AND ELECTRIC ROADS.

"Who, in 1880, had ever heard of a 'gripman' or 'motorman'? The cable and electric roads are new since then. The cost of constructing and equipping them is mainly for labor, and in this way employment has been given to great numbers of men. These novel systems of traction have given work to regiments of honest fellows who now wear uniforms. When horse cars are superseded by electricity or the cable, the number of passengers carried is always greatly increased and more cars are run, requiring a larger number of employees. The labor at the power houses is better paid than at the stables."

"The last fifteen years have witnessed the creation of the electric light, the electric railway, the telephone, and a large variety of industries depending on electricity. The inventions on which they are based have deprived nobody of employment. On the contrary, they have opened entirely new fields and fresh demands for labor. Without the aid of our patent system, which holds out to the inventor the prospect of reward, how many of these new ideas, which represent the forward steps of civilization, would remain without fruit, if not unthought of?"

"The two most important of very recent inventions are the typenaking machine and the cash register. The latter has already put on the market \$15,000,000 or \$20,000,000 worth of material, the cost of which is mainly labor. Let me not forget to mention in the list of novel industries the manufacture of the bicycle, which is new, commercially, since 1880."

A Wire Rope Tramway at Gibraltar.

A wire tramway is stated to have lately been put up at Gibraltar for connecting the signal station at the top of the rock with the lower town. It takes up all the materials necessary for the service of the fortress in less than five minutes, whereas formerly a whole day was required for cartage by a rough and difficult road. The engine house is erected at the north end of the Alameda, whence start two ropes 320 yards long, which lead to the top of the mountain. A powerful engine gives motion to the ropes carrying the tubes, one of which rises while the other descends. The ropes are calculated for a load of more than 70 tons; but they never have to support more than a twelfth of that weight.

Useful Products from Tar.

J. H. W. Stringfellow's process, London, is as follows: The tar, say 1 ton weight to be treated, is put into a suitable vessel and about 1 per cent of an alkali or other saponifying agent is then added and the compound well mixed with 1 ton of water. Before the water has time to separate from the tar, about one-fifth of a ton of petroleum oil of sp. gr. 0.820 is added and slowly stirred into the tarry compound until the free oil becomes of a reddish color. It will then be found that the compound has been separated into three parts, namely: (1) A red oily extract of light gravity, not miscible in water; (2) a substance of soft unctuous pitch, containing some water and resembling Stockholm pitch in appearance and general characteristics; and (3) a discolored, watery liquor. While the separating action is progressing, the light oily extract and the water can be drawn from the vessel, so as to promote the exudation from the pitch which remains in the vessel. After a certain point of separation has been attained, the exudation of oil from the pitch proceeds very slowly, and, moreover, the last oily extract appears to be of a heavier character; hence it is desirable to draw off the liquid after the stage of rapid separation has terminated and then again after the slow stage has ended. The pitch is now removed to a press to express as much free oil and water remaining in mechanical suspension as may be desired. If the compound of tar, water and oil is taken directly after mixing and before separation has begun, it may be thoroughly mixed with an earthy matter consisting of 1 ton of dried powdered clay and 4 cwt. of dry powdered lime, to form an asphalt corresponding approximately to the natural asphalt used for paving and other purposes. The solid residuum may also be pressed into blocks and used as fuel, for gas making or for firing and other purposes. As these solid compounds contain all the benzene and naphtha of the tar, if desired, a proportion of the volatile matters may be driven off by heat in the usual manner. The red liquor may be treated in stills in the usual way to obtain the various constituents.

Charcoal and Products.

It is proposed by T. Hill Jones to conduct the carbonizing process, to save cost of carriage of the wood, at, or in proximity to, the site of growth of the timber. The wood to be carbonized is stacked in heaps or mounds, covered with turf, and generally plastered over externally with a mixture of earth and charcoal dust. The heap is surrounded with a metal casing, which, for the convenience or portability for transmission from place to place, is constructed in separate pieces, so that it may be readily put together on the spot. Openings are formed in the turf cover for the escape of the vapors into the interstitial space formed by the metal casing. The latter is provided with an outlet for conducting the vapors given off during carbonization to a still head and thence to suitable condensing vessels. The stacks of wood may also be carbonized within a casing of brickwork. Inspection tubes may also be inserted to ascertain the progress of carbonization. By the above mode of procedure the utilization of the products given off during the process of carbonization is said to be secured without impairing the quality of the residual charcoal, the fuel value of which is materially depreciated when the carbonization is carried on in retorts.

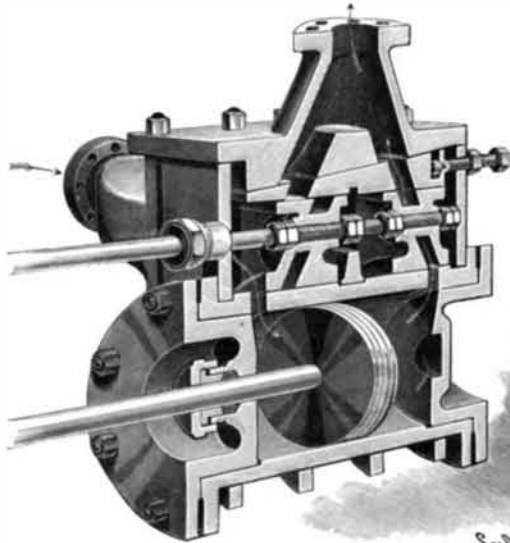
The Importance of Guarding the Coast of the United States.

An interesting estimate has recently been made of the wealth and population along the coast of the United States which it would be necessary to defend in the event of war. The Atlantic coast line, exclusive of the Gulf of Mexico, has alone the length of 2,732 miles. The entire coast line of the country, including the Pacific coast, the Gulf of Mexico and Alaska, is 10,376 miles. If, however, the bays and rivers be added, the total will be 90,929 miles. Much of this would not attract an enemy's fleet, and taking simply the outer seaboard, exclusive of Alaska, and not considering the bays and rivers, we have an actual coast of 5,558 miles to be defended. The value of destructible property within the reach of an enemy's guns will be found to be enormous. It has been estimated that in Portland, Boston, New York, Jersey City, Philadelphia, Baltimore, New Orleans and San Francisco, such property would aggregate about \$3,836,000,000. It must be considered, however, that these ports comprise only a part of those which require defense. A list of seaport towns made several years ago showed that about 7,000,000 inhabitants were included in the principal seaport cities. The estimated population of all seaport as well as lake towns is over 16,000,000. Another important consideration is that the United States has a commerce amounting to nearly \$1,500,000,000.

A NEW marking ink pencil has the solid color at one end in the usual manner and at the other end a receptacle for a liquid mordant.

AN IMPROVED SLIDE VALVE.

According to the improvement represented by the illustration, the steam chest is connected at its ends with the cylinder ports, and the slide valve operating in the chest has exhaust ports registering with the cylinder ports and with ports in an adjustable plate connected with the exhaust chest. The invention has been patented by Mr. Albert B. Van Wegen, of Coudersport, Pa. The adjustable plate, in which are ports registering with the exhaust ports, engages the tops of the valves and is fitted to the underside of the exhaust chest. It is wedge-shaped and is adjustable by means of a screw, to take up wear, so that a steamtight joint



VAN WEGEN'S BALANCED VALVE.

is at all times formed between the valves, the plate, and the exhaust chest. The valves are connected with each other by a valve stem, nuts screwing on the threaded inner end of the stem for properly adjusting the valves relative to the ports. The bearing surface of the valves is preferably shaped according to the exterior surface of the cylinder, on which a circular valve face is thus formed. The several parts are fastened in position by means of clips passing around the cylinder and whose ends pass through and are tightened up by nuts on flanges on the outer edges of the exhaust chest. With this valve arrangement full provision is made for delivering the live steam directly through straight ports, and the valve freely moves within the steam chest without requiring much pushing or pulling power.

A MACHINE TO HARVEST STANDING CORN.

As this machine is drawn between two rows of standing corn, the stalks severed by the knives are received by the farmer or his helper as they naturally fall back on the platform of the machine, the stalks being laid with their butts rearward on a dumping platform or cradle, where they may, when a sufficient quantity has accumulated, be conveniently tied in the form of a



AN IMPROVED CORN HARVESTER.

shock, and deposited upon the ground in an upright position. The improvement has been patented by Messrs. Charles A. and Harold A. Low and Albert M. Messenger, of Lake View, Iowa. The cutting knives are secured upon beveled side portions at the front of the platform, there being guards at the rear outer edges of the knives, and at the rear of the platform on each side is a railing formed of two uprights and an upper cross bar. Between these railings, and fulcrumed upon the rear uprights, is a dumping platform or cradle, which normally lies horizontally upon the platform, but it may be raised or lowered by a forwardly extending handle. A flexible shaping strap, preferably formed of spring metal in a substantially U shape, is centrally attached to the dumping cradle,

and pivoted to the rear uprights is a guide yoke whose shanks extend downward to the cradle, their lower ends having friction rollers adapted to engage the under faces of the side bars of the cradle. A retaining chain connects the shanks of the yoke with the main platform of the vehicle, limiting the downward movement of the yoke as the shock is being dumped. There is on one of the uprights a twine box and on the opposite upright is a catch to receive and hold the free end of the wire or cord, which may thus be conveniently arranged for the binding previous to commencing the formation of a shock. By means of the shaping strap the stalks are first drawn closely together before tying, after which, upon lifting the cradle, they are tipped over upon the ground. As the machine is drawn forward after dumping the shock, the cradle is restored to a horizontal position, the guide yoke being simultaneously slipped from over the shock, and, by the engagement of the rollers upon its shanks with the cradle, the yoke is carried to its normal angle, tipping slightly to the rear from the vertical.

New Agricultural Machines Called For.

Secretary of Agriculture Morton declares that the plow used by the American farmer is an enemy to fertility, and that the invention of some means of stirring up the soil and subsoil is very badly needed. He believes that the common plow, when used in stoneless soils, packs every furrow it passes over and renders it impervious to rain. The secretary explains this fact as follows:

"The draught of the plow is downward to such an extent that the full force of the team's strength is exhausted in pressing the bottom of the furrow into a polished trough for the conduction of rain down the side hills. It is necessary to stir up the soil and subsoil for eighteen inches. If, for instance, it were possible to loosen the soil and subsoil down for three feet all over the State of Nebraska, we could then, with an annual rainfall of twenty inches, make abundant and profitable crops. Until deep plowing—through subsoil tillage—becomes universal in that commonwealth, there will be, year in and year out, no certainty of remunerative crops.

"Prof. Shaler, of Harvard, estimates that the present inefficient and ill resulting methods of plowing, especially upon undulating lands, cost the agriculturists of the United States 250 square miles of soil each year by erosion. Everywhere in Nebraska, where torrential rainfalls are so frequent, the side hills verify Prof. Shaler's theory as to the annual waste of washed lands.

"This is a matter of such vast importance," continued the secretary, "that I have asked Chancellor Canfield, of the University of Nebraska, to bring it before the sixteen hundred students in that institution and ask them to try and think out a new implement of agriculture which shall supersede the plow. It is a subject upon which the inventive minds of educated farmers should be concentrated. A proper solution of the difficulty will facilitate subsoil tillage and at the same time save both the crops and the soil.

"In my judgment the coming implement should spade the land and turn it over, as a man who pushes the spade with his foot into the ground, and, drawing the spade out, turns the soil upside down by the twist of his wrists. Possibly a rotary spader could be invented. Possibly an implement consisting of a large number of revolving knives could be made so that in passing over the surface of the field it should chop up the soil and subsoil for two feet in such a manner as to render the percolation of the rainfall, down to the depth at which the ground has been stirred, very easy and perfect."

[We think if the records of the Patent Office are examined, various devices for subsoil stirring, also spading and digging machines, will be found.—Editor SCIENTIFIC AMERICAN.]

Soap and Washing Compounds.

Two molecules of sodium sulphate and one molecule of sodium bicarbonate are dissolved in water. The solution is boiled and allowed to crystallize, when a new body, termed "a basic carbonated sulphate of soda," is formed, the crystals of which salt possess the following composition:

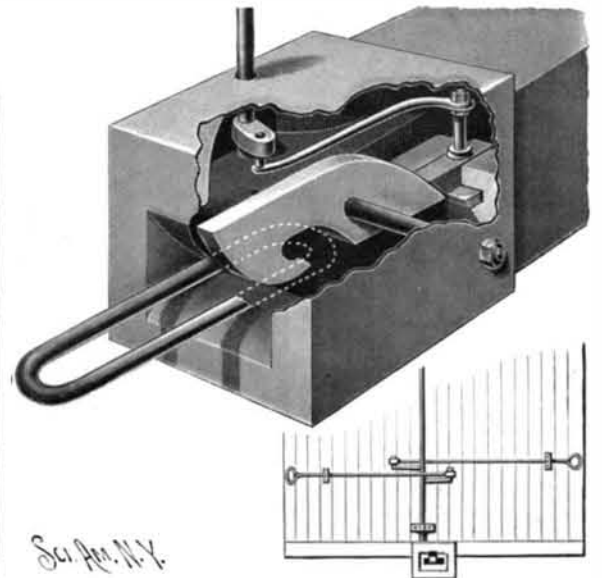
Sulphuric anhydride.....	21.27
Carbonic acid.....	5.15
Soda.....	31.50
Water of crystallization.....	42.08
	100.00

It is feebly alkaline, and is said to possess great detergent power.

In using this product for the manufacture of soap, six parts of fatty acids are heated to 120 degrees to 130 degrees C.; then five parts of the "basic carbonated sulphate of soda" (melted in its water of crystallization) are gradually added, and the whole boiled until the fatty acid is saponified. A washing powder may also be prepared by grinding together the sodium sulphate and bicarbonate in the dry state. It is said to be less hurtful to the skin and fabrics than ordinary soap is.

AN AUTOMATIC CAR COUPLING.

The illustration represents a simple form of coupling in which the old style of link is used, the coupling together of the cars being effected automatically, while the cars may be uncoupled from either side or from the car roof. For this improvement a patent has been granted Mr. Henry C. Morton, of Mint Hill, Mo. In a chamber of the drawhead is pivoted a latching hook having a downwardly curved hook nose, while the rear end of the hook has its top edge convex curved. Opposite and adapted to bear upon the rear end of the hook body is arranged a slide block having a vertical

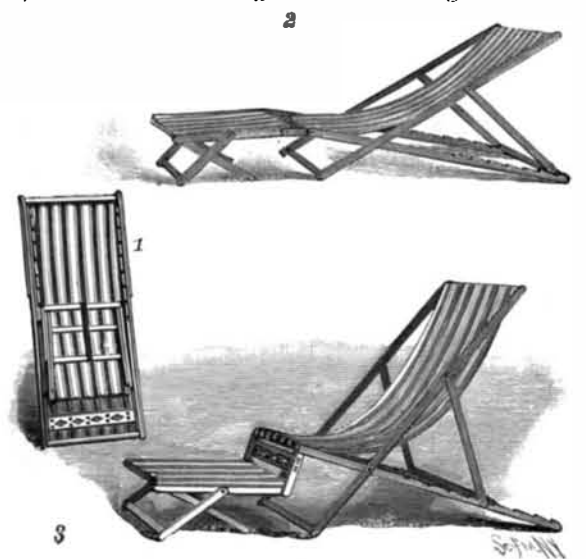


MORTON'S CAR COUPLING.

post connected by a horizontal curved bar with an arm on the lower portion of a vertical shaft, the latter being extended up to the roof of the car, where it is provided with a hand wheel. On the vertical shaft are also two crank arms, just above the drawhead, as shown in the small view, a pull bar extending from each crank arm to one side of the car. When two cars are to be coupled, the link is introduced in one of the drawheads and held in horizontal position by the latching hook as indicated by the dotted lines, the coming together of two cars then causing the hook of the approaching coupling to slide upon and over the end of the coupling link, and drop by gravity to the locked position. When the cars are to be uncoupled, the train man, by means of the hand wheel or one of the pull bars, rotates the shaft to move forward the slide block, thus depressing the rear end of the hook and raising its front end, whereby the link is released.

A CONVENIENTLY ADJUSTABLE CHAIR.

The chair shown in the picture has a flexible back and seat, and is readily adjustable to permit one to sit or lie at any desired inclination. It has been patented by Mr. Hermann Evers, of Mazatlan, Mexico. The illustration represents the chair folded up, in extended position for lying down, and in a more upright position, with its foot and leg extension arranged to form



EVERS' FOLDING CHAIR.

a footstool, although, as will be readily seen, these are only a few of the various adjustments provided for. Its rectangular pivoted frames, supporting the seat webbing, are held in desired adjustment by the engagement of a cross bar connecting the pivoted legs with notches in the lower side bars, after the usual style of steamer chairs, and to the front ends of the side bars is hinged a foot and leg rest. The hinge connection consists of links and a cross bar, forming a double hinge, and the front end of the leg rest is supported by a frame adjustable to any desired position for sitting or reclining, or permitting the extension to be folded back underneath and fastened to the chair frame, when the chair may be used as one without an extension.

A NEW BOLT CUTTER AND NUT TAPPER.

The machine shown in the illustration has been especially designed to screw-thread the larger sizes of bolts and nuts, and is consequently made very strong and stiff, being also adapted to cut all sizes from a quarter of an inch to two inches in diameter. It has been recently placed on the market by Messrs. Wells Bros. & Co., of Greenfield, Mass. It has three step-cone pulleys, is back geared, and is furnished with friction clutch countershaft, increasing its capacity to turn out work rapidly. The drawers in the base of the machine afford convenient receptacles for tools not in use.

THE COMING ATLANTA EXPOSITION.

The New South was not satisfied with the inadequate display made of its industries at the Chicago Exposition of 1893; so that before the World's Fair closed it was virtually decided to hold a special Cotton States Exhibition at some city in the South. The project was warmly favored by the Southern press. Atlanta, Georgia, was selected as the site for the exhibition, and the result of the unabated zeal of the promoters is the Cotton States and International Exposition, which will be held during the winter of 1895-96. It will be opened September 15. An expenditure of over \$2,000,000 has been provided for, and the scope of the enterprise has been enlarged to include exhibits from all States in the Union and foreign countries. Atlanta is one of the most progressive cities of the New South, is a great railway center, and has a population of 65,533, according to the census of 1890. The president of the exposition is Mr. Charles A. Collier.

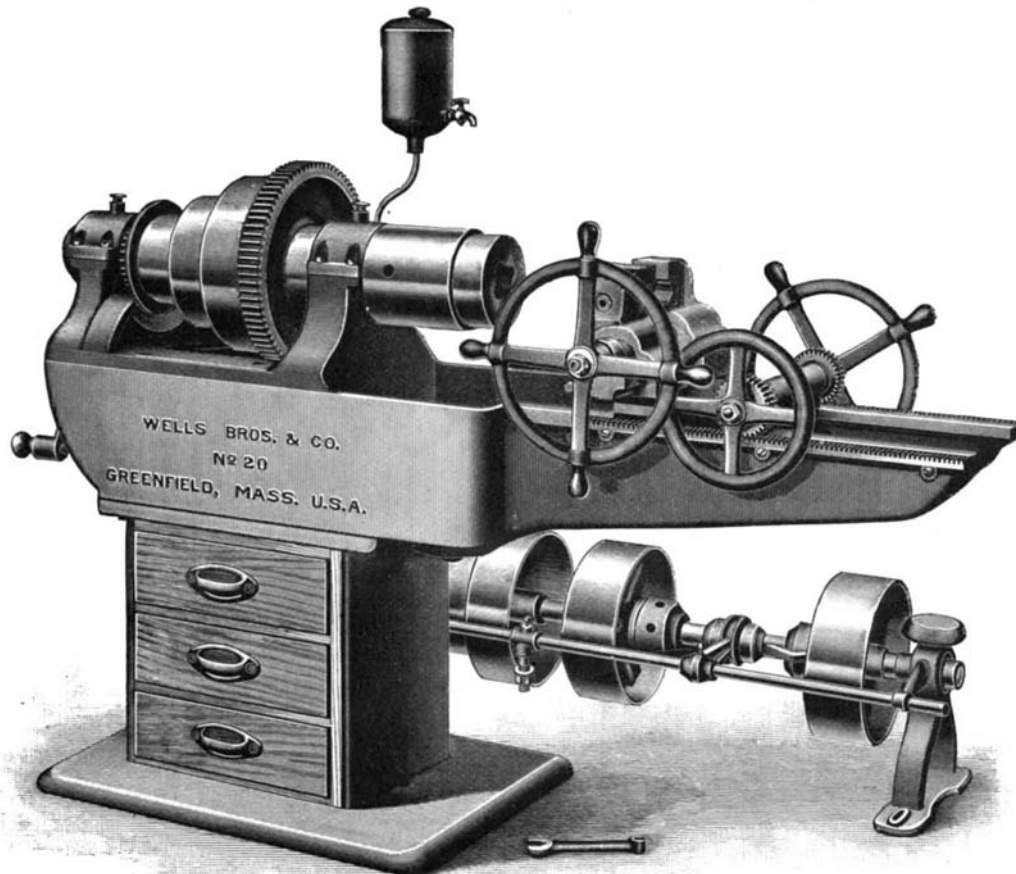
The exposition will be held at Piedmont Park, a site which possesses remarkable advantages. The park is situated about two miles from the heart of the city, and is approached by the Southern Railway and handsome drives. Piedmont Park includes about 189 acres, and \$550,000 will be spent in heightening the natural advantages by skillful landscape gardening and the creation of artificial lakes. Gondolas and launches will be a feature of the exposition. It is not intended to have the new exposition attempt to rival the Columbian Exposition either in architecture or industrial pretensions; but it will be a complete exhibit of the resources and industries of the New South. The old race track has been converted into a garden of Southern flowers, with an electric fountain in the center. This garden will be in plain view from all the buildings and from the high knolls on the borders of the park, and with the great lake behind it will make a beautiful setting for the architecture of the Fair. To the north of this central garden will stand the Government building, which is located between the Fine Arts building and a group of foreign and State buildings. The grouping is so artistic that no structure will be behind another. To

the east of the Government building and with the long side fronting on the garden is the Manufactures building. Between the garden and the lake there is ample space for the Woman's building and the Horticultural building. On the further border of the lake, which will occupy over 20 acres, will be grouped the Electricity, Mining, Transportation, Music, Machinery, Minerals and Forestry buildings. In the extreme southern ground, occupying a commanding position, are the Negro and Tobacco buildings. The circuit of the grounds will be completed by the Agricultural

about 900 pounds weight of silkworms' eggs were used in these towns and villages. The eggs used in Syria are of Corsican origin; the greater part come from France and a small quantity from Italy. As regards the Japanese varieties, these have entirely ceased to be imported. It is the merchants of Beyrout and the Lebanon who engage in the business of importing silkworms' eggs, and who sell them to the Syrian breeders. These merchants exercise the greatest care in all their operations, and some even go so far as to travel themselves to France to make their purchases.

All the eggs imported are subjected to a most rigorous examination, and in some cases they are examined by means of microscopical instruments. They arrive in boxes of about twenty-five grammes weight, and are sold at prices varying from three to six francs, according to quality and guaranty. The payments are made at once, or at the end of the harvest, in kind—that is to say in cocoons. In the latter case the amount due to the seller varies according to the district. For example, at Rachaya, in the villages of Ouadi-el-Adjam and Douma, one-seventh of the silk harvest is given; at Baalbek and Hasbaya a little more, and in the villages of Bekaa, one-twelfth. This difference is accounted for by the fact that the yield of eggs is by no means the same in all localities in which the silk industry is engaged in, on account of the greater or smaller amount of care and attention bestowed by the breeders—for the climate is favorable throughout the country. Attempts have frequently been made at the production of native eggs, but they have invariably been unsuccessful. This is generally attributed to the following causes: That

A LARGE-SIZE BOLT CUTTER AND NUT TAPPER.



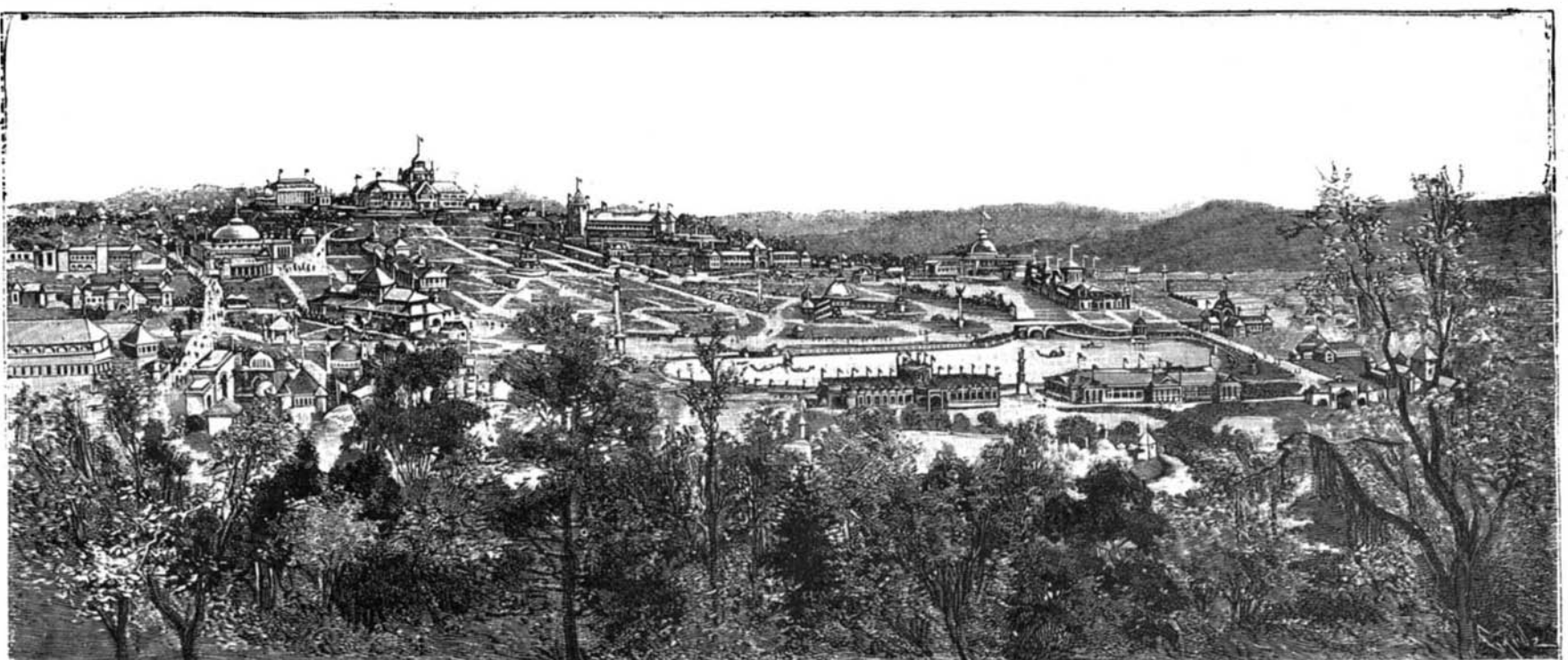
building, the Auditorium and the Theater. Other minor buildings will also be erected.

Cheap imitations of the Columbian Exposition's buildings have been avoided, and as much attention has been paid to the interior as to the exterior. The government promises to have one of the finest buildings on the grounds; the appropriation was \$200,000. The negro exhibit will be particularly interesting, and will illustrate the progress made by the race since their emancipation. The "Midway Plaisance" will be the Terraces, and only genuine attractions will be permitted.

The Silk Industry in Syria.

The production of silk in Syria has, says the Journal de la Chambre de Commerce de Constantinople, considerably increased of recent years. The towns and villages in which the greatest attention is devoted to the sericulture are the following: Baalbek, Serin, Ras, Machghara, Sahbine, Chtora, Hasbaya, Ain-el-Hraiche, Ain-Ata, Brit Lahie, Nabeh, Malonia, Giroud, Maara, Sidnaja, Essal-el-Ward, Douma, Khyara, Chafounie, Jaramana, Chabaa, Catana, El Hame, and Tsaxa. In 1893

the choice of the worms is made without due care and attention; that the eggs are not examined microscopically; the color and dimensions of the cocoons are mixed, and the eggs are not preserved until the moment of incubation, in favorable places. In Syria the weaving of silk is as old as the cultivation of the raw material itself. The silk weavers of the present day work principally for domestic production. The native manufacturers have had much to contend with from foreign competition, which made itself severely felt, and markets that were formerly controlled by Syrians are now disputed by European manufacturers, who, with their skilled artisans and with the aid of improved machinery, find competition with the older methods comparatively easy. The greatest specialty in the native silk stuffs, and in which Syria undoubtedly excels, is that in which cotton forms the warp, and in which the greater or lesser quantity of silk in the weft determines the quality. The principal silk manufactures are the Kaffehs, or headdresses, Aboyas, or Syrian cloaks, shawls, tobacco pouches, slippers, pillowcases, stuffs for dress goods and stuffs for upholstery.



BIRD'S EYE VIEW OF THE COTTON STATES AND INTERNATIONAL EXPOSITION AT ATLANTA, GA., TO BE OPENED SEPT. 15 1895.

Books of the Ancient Mexicans.

At the 289th corporate meeting of the Boston Scientific Society, the principal paper was entitled *The Cortes Codex*, the speaker being Dr. J. Walter Fewkes. When Cortes landed in Mexico, he found a people who were about equal in civilization to the ancient Etruscans. It is true that they did not have the art of working iron, but they were a literary people and actually had books. A system of writing seems to have been common to all the peoples of Mexico and Central America, and in Yucatan, it appears, a much greater advance in the art had been made than in the other States. When the lieutenants of Cortes landed in Yucatan, the priests, imbued with the strong religious feeling of the age, declared these books to be instruments of the devil, and they were publicly burnt, very many of them being destroyed. But in some way four of them found their way to Europe, where they were placed in libraries, and it is now permitted to scholars to study them. These books are what are known as codices, and of them Dr. Fewkes spoke quite in detail.

The first and best of the codices is in Dresden. It is a book about ten inches in length and three or four in width; the material of which the paper is made is the agava pulp, and upon this characters are painted. The books open after the fashion of the Japanese screen, and both sides are used for the letters. The Dresden Codex has been closely studied by Dr. Foerstemann, who has published a volume on the subject. The second of the Maya books is in the Bibliotheque National, in Paris, but it is small and poor. The two others are in Madrid and are known as the *Codex Cortesianus* and *Codex Troyanus*. Of the former, Dr. Fewkes spoke in particular, both fragments being considered, however, to have been originally parts of the same book. With the enlightened spirit of the age, the Spanish government published in 1892 a facsimile of the *Cortes Codex*, in commemoration of the discovery of America by Columbus. One of these facsimiles is in the possession of Dr. Fewkes, being a book of forty-two pages.

The characters which are to be found in the *Codex* are the same as those covering many ruins in Central America, figured on pottery and scratched on bone and shell, and if the books can be deciphered, there will be furnished the key to these old writings which have not yet been read. The characters may be broadly divided into three groups: numerical signs, pictorial elements and hieroglyphics; the latter group being divisible into day signs and hieroglyphs pure and simple. The most acute scholar in the numerical part is Dr. Foerstemann, who has shown that the people who made these books knew numbers, and very high numbers at that. Dr. Foerstemann deciphered the zero and the numerals which run into the millions, the higher ones of which have some relations to the planetary times of revolution.

The investigator who has done most to determine the exact character of the hieroglyphs was Brasseur de Bourbogne, who found the *Cortes Codex* the symbols for the days, and concludes that it has significance in an astronomical or astrological sense.

The work of Dr. Fewkes in the matter has been in the consideration of the pictorial elements of the *Cortes Codex*. He has first assumed that the pictures are related to the other characters. In examining the pictures of the *Codex*, he has found that there are one hundred and twelve altogether—animals, men, and humans with monstrous heads or masks. What do the latter mean? Through his knowledge of the habits of the Moqui Indians, he was aware of the place of the personification of the different gods in the ceremonies, this being done by a man with a symbolical mask. Accordingly he had studied the different masks in the *Codex* and had been able to find among them the symbols which belong to certain of the gods—the god of war, a skeleton, the long-nosed god, the snake god, the corn goddess, and the like. In an interesting manner, aided by enlarged drawings of the *Codex* figures, he showed the reasons for connecting a certain picture with a certain god. All the figures, the animals excepted, can be thus referred to some of the gods, and they seem to have relation to the astronomical signs, although that matter has not yet been cleared up.

Dr. Fewkes was particularly interesting in the description of his investigations, referring incidentally to the customs of the modern Indians, relating an occasional legend and describing the secret ceremonies of the secret societies of the Moqui Indians, being himself a member of these societies and having witnessed their ceremonials. His paper was made the more interesting by the exhibition of facsimiles of the different *Codices*, works of great rarity and value, which he has acquired in his study of these antique bits of writing.—*Boston Commonwealth*.

Cleaning Clothing.

Mullerson's preparation is a mixture of turpentine, 26½ parts; ammonia solution, 19 parts; methylated spirit, 25 parts; ether, 2¼ parts; acetic ether, 2¼ parts; and water, 25 parts; all by weight.

Gold Production in South Africa.

The extraordinary growth of the gold mining industry in South Africa, and the consequent rush to invest money in a country which was hardly known five years ago, but which now takes rank second among the gold producers of the world, make a brief analysis of the reports available from the Witwatersrand District in the Transvaal, from which nine-tenths of the South African production is at present drawn, a matter of much interest. The material for this analysis is found in the reports issued each month by the Johannesburg Chamber of Mines, which give in detail the output of the district.

The rapid growth of mining is shown at a glance by a statement of the gold production for four years past, which was: 1891, 729,238 ounces; 1892, 1,210,868 ounces; 1893, 1,478,477 ounces; 1894, 2,035,970 ounces. The output for last year was thus very nearly three times that of 1891. A comparison of the years 1893 and 1894 may enable us to draw some conclusions as to the district and its future.

An important point in the returns for last year is the gradual and apparently steady decrease in the average returns per ton obtained. The total amount of ore worked last year in the mills was 2,827,365 tons, and the average obtained per ton by milling work was 0.46 ounce (0.37 fine ounce = \$7.65) per ton. This was a decrease of 3.4 per cent from the average reported in 1893. If we take the complete returns, including all gold obtained from concentrates and tailings as well as from milling, we find the average return on the ore mined in 1894 was 0.72 ounce (0.576 fine ounce = \$11.91) per ton, against 0.67 ounce (0.536 fine ounce = \$11.08) per ton in 1893. That this increase was only apparent, however, is shown by the fact that the quantity of tailings worked over last year was 2,674,673 tons, while in 1893 it was only 1,217,792 tons: that is, the output of 1894 included a considerable amount from accumulated tailings of previous years' workings. A fairer way of comparing the averages is to take each source of production separately, as we have done in the following table:

	1893.	1894.	Changes.	Per cent.
Ore milled.....	2,203,704 tons.	2,827,365 tons.	I. 623,661 tons.	28.3
Tailings reworked.....	1,217,792 "	2,674,673 "	I. 1,456,881 "	119.6
Yield per ton, ore.....	0.479 oz.	0.462 oz.	D. 0.017 oz.	3.4
" " " tailings.....	0.250 "	0.222 "	D. 0.028 "	13.6
Total yield.....				
Milling ore.....	1,056,383 oz.	1,305,408 oz.	I. 249,025 oz.	23.6
Tailings.....	304,498 "	587,388 "	I. 282,890 "	92.9
Concentrates.....	62,737 "	84,579 "	I. 21,842 "	34.8
Other sources.....	54,859 "	58,595 "	I. 3,736 "	6.8
Total.....	1,478,477 oz.	2,035,970 oz.	I. 557,493 oz.	37.7
Fine ounces.....	1,189,782 "	1,628,776 "	I. 448,994 "	37.7
Value.....	\$24,448,096	\$38,666,900	I. \$9,218,804	37.7

In giving the fine ounces and the value throughout we have taken Witwatersrand gold as 0.800 fine, this conclusion being derived from the statements of its value uniformly given. It is much to be regretted that for this—and indeed for every—district the returns are not made in fine ounces.

Several points are brought out more clearly by this table. Fully as large and perhaps a larger part of the gold was saved in milling last year; for while the proportion of mill gold was 64.1 per cent of the total in 1894 and 71.5 per cent in 1893, the difference is more than accounted for by the large increase in quantity of tailings. The amount obtained from concentrates, chiefly by chlorination, shows some increase in the pyritic contents of the veins as the workings increase in depth, but not in any large proportion. Taking the ore and tailings together, we find that there was an increase of 60.8 per cent in the tonnage handled to obtain an increase of 37.7 per cent in the gold output; but these proportions will hardly hold good in the present year, when the proportion of tailings worked to ore milled will probably be much less than it was last year.

The important data as to the cost of working on the Witwatersrand are lacking. The amount paid in dividends has been large, but there are many companies which have paid nothing to their shareholders. The cost of supplies and fuel is gradually decreasing, owing to the improvements in transportation and the development of the coal resources of the Transvaal; but these savings may be offset by the increasing demand for labor, and the difficulty of obtaining it. So far we have nothing on which any close estimate of the average cost of mining in the district can be based, and only the fact that many companies are paying dividends on returns of \$10 or \$12 per ton seems to show that these low grade ores can be handled at a profit. More detailed information as to costs would be of the greatest interest to the mining world.

As to the future production of the Witwatersrand no predictions can safely be made. The old accumulations of tailings are nearly exhausted, so that the addition to the output from this source will be somewhat less hereafter. The confidence of the large companies in the future is shown by the fact that they are adding to their mill capacity and the 2,400 stamps now at work will be increased by nearly one-half within the next six

months. While the ore shows a tendency to decrease slightly in value with depth, there are no indications of its exhaustion. Moreover, there is a considerable area, through which the great banket vein is believed to extend, which has been hardly touched as yet. On the other hand the general belief in the richness of the vein at great depths rests thus far on the indications of a few borings, and none of the "deep level" companies which are now sinking exploration shafts will be in a position to report results for a year to come.

It is fairly safe, however, to expect a large production from the Witwatersrand for at least several years to come; and when the mines of that district begin to show signs of inevitable exhaustion, the new fields of Matabeleland and Mashonaland will probably be producers, so that South Africa will continue to be a very important factor in the gold supply of the world.—*Engineering and Mining Journal*.

Dishonesty the Nation's Peril.

Anybody who has been but a casual observer of events in this country must have been forcibly impressed with the recent growing tendency to dishonesty and downright villainy in politics, official life, corporate responsibility and private business obligations. There may be as many honest men in all these relations to-day as at any period of the country's history, but it looks as if there were certainly an augmenting number of rank rascals.

This is seen first in the almost entire lack of honesty, honor and patriotism among politicians, the men who run the political machinery, from the township organizations to State and national conventions. Politics has become a word to which nobody but an ignoramus or a sophisticated office seeker attributes any element but that of dishonesty and fraud. It means a scheme of designing men to get the offices and thereby the chances to deceive and rob the people. In the older days of the republic men who sought office claimed and were accorded some degree of honor and sense of responsibility to their constituencies. They were to a large degree, at least, actuated by a patriotic desire to

acquit themselves so as to be considered patriotic citizens, with a good name to preserve and hand down to posterity. Probably that feeling and motive is somewhat rife in the rural communities at the present time; but in the larger cities, if any of it remains, it is neither conspicuous nor emphatic. Men now seek office "for what there is in it" to them, and with small regard to the good of their constituents. They connive and combine to get the support of the worst elements in the community, because those elements represent the greatest number of votes. They cajole and fool the ignorant, the debased, and the victims of demagoguery for the sake of votes, and the selfish partisans among the so-called better classes fall into line so as to be on the winning side. Officials thus elected cannot be expected to administer public affairs with much reference to anything but their own selfish interests. It cannot be expected that they will be much better than their constituencies. The effect of this debased motive in politics is to prostitute legislation to partisan ends, which are usually those of compromise with cliques which conspire to rob the people and fatten the conspirators. It also enables a lot of mediocre or low grade, unprincipled men to get into office, and thus the body politic is permeated with dishonesty and, what is almost as bad, brainless, conscienceless incompetency.—N. W. Lumberman.

The Late Crown Prince of Siam.

In accordance with Siamese custom the body of the late prince, after being very tightly bound up, with the knees brought up under the chin, was introduced into an iron urn, which again was put into a magnificent urn of gold, studded with precious stones. This has been placed on a golden, four-sided, truncated pyramid, about 9 feet high and 12 feet square at the base, in a small room in a building adjoining the grand palace, and known as the Phratenang Dhusidh Neahaprasadh. The room is suitably adorned with mourning emblems; one wall contains the late prince's orders, etc., in glass frames. A large body of Buddhist priests chant appropriately in an adjoining room night and day, and several of the king's brothers are in constant attendance round the catafalque. And there the body will remain, probably for a whole year, to be then consigned to the flames with extraordinary pomp on an enormous funeral pile.

THE NAPHTHA LAUNCH OF THE GAS ENGINE AND POWER COMPANY OF NEW YORK CITY.

No type of a power-propelled boat has acquired such popularity in so short a space of time as has the naphtha launch. The proprietors of the establishment where these boats are manufactured, the Gas Engine and Power Company, of Morris Heights, 185th Street, New York City, term it "the only naphtha launch," and with very good reason, as hitherto it has been without real competitor. While these boats are used extensively in all waters, and have become a most familiar object to all, it is fair to say that very few people know how they are operated.

The engine by which they are driven is a three cylinder, single acting engine specially constructed for naphtha, although it will work perfectly well with steam or compressed air. The engine is surmounted by a double asbestos-lined jacket resembling in contour a boiler. Within the jacket is a coil of pipe, immediately below which is a burner for naphtha gas or vapor.

Referring to our illustration of a section of the naphtha launch, a tank for holding the naphtha will be seen in its extreme bow. From the tank a pipe connects with a small pump at the base of the engine, by which naphtha is pumped into the coil of pipe. Into the top of the coil boiler, for such it is, a pipe is tapped that supplies naphtha to the burner. In operation the coil is first made hot. This is done by hand-pumping naphtha vapor mixed with air into the burner, where it is lighted. When the coil is hot, naphtha is pumped into it. This is at once vaporized and develops pressure. The pressure is turned on the engine, which in a few minutes starts to rotate. An injector cock supplies the burner with naphtha, drawing air in also, and the engine thereafter takes care of itself.

At each stroke naphtha is pumped into the coil by the engine. This develops in ordinary practice a pressure of sixty-five pounds in the heated coil. From the top of the coil the naphtha vapor, before it reaches the burner, is drawn off and mixed with air after the fashion of the Bunsen burner. It burns below the coil with a clear blue flame. Near the injector is a damper by which the supply of air is regulated so as to produce this character of flame. After the naphtha vapor has acted upon the pistons and goes off through the exhaust it is condensed. A regular outboard condenser is employed, the pipes running along outside the garboard of the boat. The naphtha thus condensed is forced back into the tank to be used over and over again. The delivery of naphtha from the tank can be cut off by a special valve, shown in a section of the boat, which valve, however, in practice never need be closed.

One of our illustrations gives a perspective view of the engine, while another one shows it in section, giving a complete detail view of the construction. The view in elevation shows the general disposition of parts. At A is seen one of the sight holes, by which the character of the flame can be watched so as to be regulated. Through this hole, too, the burner is lighted, and further up in the casing is a second sight hole, through which, also, the flame can be watched. At C is the injector valve, and immediately below can be seen the flaring mouth with damper, I, by which the air supply to the burner is regulated. D is the naphtha valve through which the naphtha is admitted. B and E are respectively air valve and air pump, which are used only for starting the engine. F is the naphtha pump used for the same purpose. This pump goes out of use once the engine is started, a separate one worked by the engine itself doing the work. The hand wheel, G, starts and reverses the engine according to which way it is turned.

Our view of the section of the engine may be studied more intelligently after inspection of the elevation. The cut shows its three cylinders with the piston rods bearing against hard steel cups beneath the pistons. Each piston is surmounted by its own slide valve, which slide valves are operated by a triple crank shaft. The burner and naphtha coils and the construction of the injector valve, nozzle and air damper are also made clear. Leading out to the right is seen the shaft, whose thrust is taken by a ball bearing, which is seen in section immediately forward of the after sleeve coupling.

In starting it air is pumped into the naphtha tank, escaping therefrom highly carbureted, so as to provide what is practically a gas for starting the fire. The whistle is blown by a hand pump, or in some of the boats an air tank is established forward, which is kept charged with compressed air by the engine, and the whistle is blown by this air. In our sectional view of the boat the air tank is shown immediately aft of the naphtha tank.

The working parts of the engine are completely incased, so that all leakage of naphtha goes direct to the exhaust chamber. Another point of safety is that the fire is taken direct from the boiler, so that if the feed pump should fail to work, shutting off the naphtha supply to the boiler, the fire would at once go out, and the engine would stop.

These little boats have won for themselves an astonishing record. They seem to be as absolutely secure from accident as any kind of power-driven craft can be. Every possible precaution is adopted in their construction to render accident impossible. The boiler is made sometimes of seamless copper tubing, sometimes of heavy iron tubing, with sleeve or threaded joints brazed throughout. The entire engine compartment is bulkheaded off and lined with sheet brass, so that if naphtha burns there it does no harm. The naphtha tank compartment is also bulkheaded off and communicates by sea pipes with the water, so that water is continually going in and out, washing away any trace of naphtha. The entire midship section or waist is unobstructed, and under normal conditions whatever slight amount of heat there may be from the engine is carried aft, away from the passengers. The company's tests have been most exhaustive, but nothing proves the safety of the boats so much as the record which they have made since the foundation of the company. Our other views show the interior of the boat building shop, where will be recognized the familiar form of the hull of the naphtha launch.

Growth of the Phosphate Industry in the South.

It is not generally known that the United States is fast becoming the principal phosphate producing country in the world. The interest is one of the first importance from both the commercial and economic standpoints, and it is remarkable that it has been developed to its present proportions since the civil war. Phosphate beds were discovered in South Carolina as far back as 1837, but they were not worked to any extent until 1868, when their output amounted to some 11,862 tons. Rich deposits of phosphate were found in Florida in 1881. The growth of the industry in these two States during the past few years has been very remarkable. In South Carolina last year some 30 phosphate mines produced 294,000 tons of phosphate and in Florida 106 mines yielded during the year 500,000 tons. The total output of the entire country for the year was 1,550,000 tons, and this exceeded the output of Germany, which was the largest European phosphate producing country, by 50,000 tons.

The importance of the phosphate beds in enriching a vast area of farm land, and thus developing the agricultural interests of the United States, can hardly be overestimated. The production of our enormous cereal crops results in a constant exhaustion of the soil. It is estimated that a single crop of cereals in the United States takes from the soil upward of 17,650,270,800 pounds of mineral matter and over 2,000,000,000 pounds of ash and phosphoric acid. An acre of land must supply about 19 pounds of phosphoric acid to produce one cereal crop. The need of returning to the soil some of the phosphoric matter which is constantly being drawn from it in time becomes a necessity. The numbers of abandoned farms in New England bear witness to this fact. In the South, and especially in the vicinity of the phosphate beds, the phosphate has been used in immense quantities. Georgia consumed the largest quantity, or 280,000 tons, and South Carolina 200,000 tons. The New England States used in all 60,000 tons; New York 90,000 tons; Pennsylvania 150,000 tons; and Delaware 20,000 tons. It is significant that very little phosphate was used in the West, where the soil is still virgin. The phosphate deposits cover a large territory in North and South Carolina and in Florida, and it is believed that the supply cannot be exhausted for many years.

Storage Battery Traction in Paris.

Regarding electric storage battery traction on the lines of the Tramways Nord, at Paris, the Revue Industrielle says that the cost per car kilometer has been found to be 0.53 fr., as compared with 0.56 fr. for animal traction. This, however, does not take into account the cost of battery repairs, which would increase the figure for electric traction quite considerably. The storage battery cars used by the company will seat 52 passengers, and, within the city, run at a maximum speed of $7\frac{1}{2}$ miles an hour. Outside of the city limits the speed can be increased to about 10 miles an hour, and even on the heaviest grades does not fall below about 4 miles an hour. Each car is equipped with a battery of 108 cells, divided up into 12 boxes of 9 cells each. These are united into 4 groups, each capable of supplying a 50-volt current. Two motors are on each car.

Drops.

Dr. Eder, in the following table, gives the number of drops required to make a cubic centimeter, showing the variations in the size of drops of different liquids:

Water.....	20
Hydrochloric acid.....	20
Nitric acid.....	27
Sulphuric acid.....	28
Acetic acid.....	38
Castor oil.....	44
Olive oil.....	47
Oil of turpentine.....	55
Alcohol.....	62
Ether.....	68

Correspondence.

Commencement of the Manufacture of American Plate Glass.

To the Editor of the SCIENTIFIC AMERICAN:

Mr. Ford built his first works at New Albany, Ind., in the year 1869. This was the first attempt to manufacture polished plate glass in the United States, although rolled plate glass had been made for a number of years prior to that time. In the year 1882, Mr. Ford came to Pittsburg and formed the New York Glass Company and established a plate glass works at Creighton, and from this small beginning emanated the Pittsburg Plate Glass Company of to-day, which leads the world in this particular line of industry. The establishment of the plate glass manufacturing industry in the United States has reduced the cost to consumers over 200 per cent. This has been brought about through wresting the monopoly from the European manufacturers who formerly controlled the market, by reason of greatly improved methods of manufacture introduced from time to time from the inventive minds of American workmen, and by the home production of all the raw materials required in the business, which was developed as the growth of the business created the demand, and which greatly cheapened the cost.

In this connection, it is interesting to note the effect home production has upon the cost of materials, which, up to the time of the introduction of their manufacture in this country, were made and controlled by Europe. When Mr. Ford first started his New Albany works, he was obliged to import all his woolen felt for polishing, at a cost of \$1.45 per pound; to-day the entire consumption is made in America, at a cost of less than 60 cents per pound, and not only gives employment to a large number of workmen, but affords a large market for American wool as well. Another remarkable instance is soda ash, or carbonate of soda. In 1869, this material was imported from England, and cost in the neighborhood of \$60 per ton. To-day Mr. J. B. Ford is making better soda ash than was ever imported from England, at his works in Wyandotte, Michigan, for about \$20 per ton.

F. S. BRACKETT.

Creighton, Pa., February 5, 1895.

Artificial Whalebone.

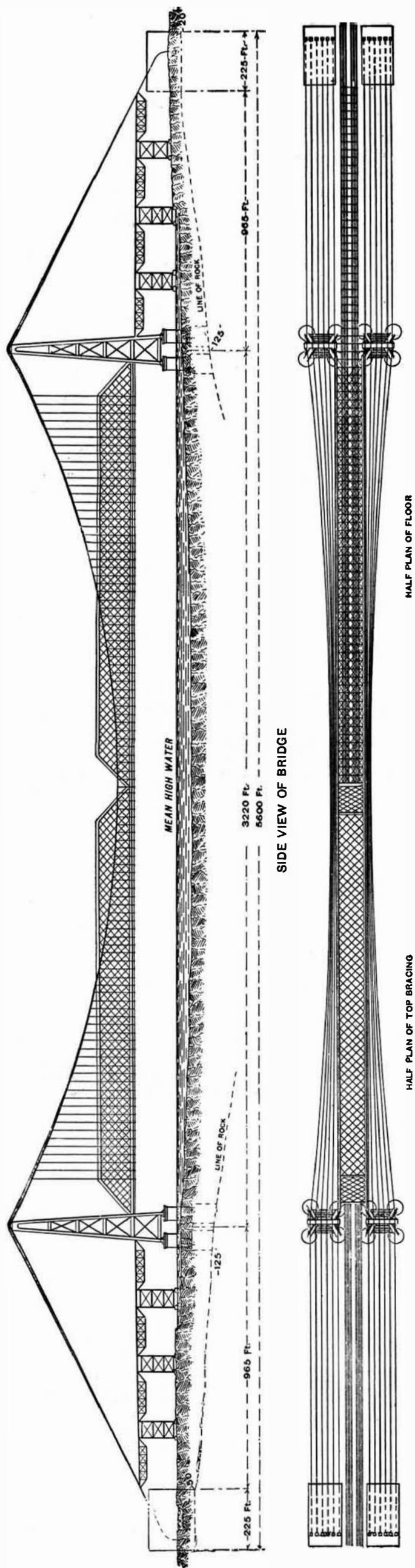
According to Le Genie Civil, the Munk process for the manufacture of artificial whalebone consists in first treating a raw hide with sulphide of sodium and then removing the hair; following this, the hide is immersed for a period of twenty-four to thirty-six hours in a weak solution of double sulphate of potassa and is then stretched upon a frame or table, in order that it may not contract upon drying. The desiccation is allowed to proceed slowly in broad daylight, and the hide is then exposed to a temperature of from fifty to sixty degrees; the influence of the light, combined with the action of the double sulphate of potassa absorbed by the skin, renders the gelatine insoluble in water and prevents putrefaction, the moisture, moreover, being completely expelled.

Thus prepared the skin is submitted to a strong pressure, which gives to it almost the hardness and elasticity which characterize the genuine whalebone, with the advantage that before or after the process of desiccation any color desired may be imparted to it by means of a dye bath. The material can be rendered still further resistant to moisture by simply coating it with rubber, varnish, lac, or other substance of the kind.

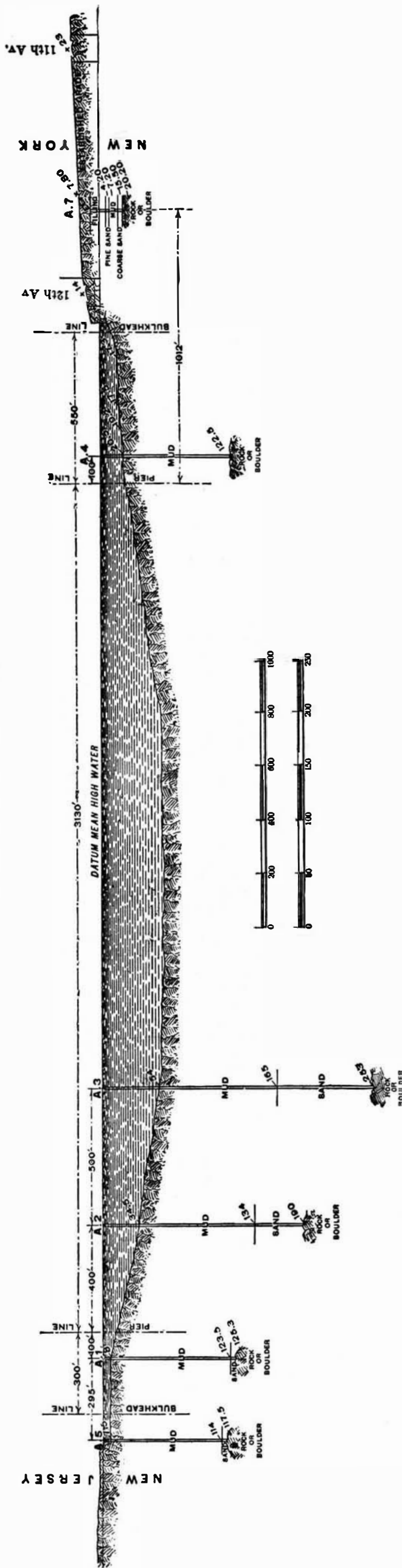
Hotels in East India.

A hotel in India is in some respects quite unlike a hotel anywhere else in the world. Every guest has a servant of his or her own. The hotel has some servants, but the guests do not depend upon them at all. My servant takes care of my room, brings me my tea and toast when I arise, prepares my bath, and waits upon me at table. He also keeps my clothes clean and my boots blacked, sees to my laundry, gets me a carriage when I want one, and does my errands. When traveling he will attend to the tickets and the luggage and make my simple bed on the cars, for India is a country of magnificent distances, involving considerable night travel. There are no regular sleeping cars like ours, but the seats are long enough for the passengers to stretch out on and wide enough to make a reasonable couch, which the traveler provides with his own thin mattress, pillow and wraps. The number of servants in a great hotel is confusing at first. In a long corridor you see one before each door. They usually sleep there, wrapped in a sheet or blanket and curled up on the floor.

RECENTLY a court in New York decided that money dropped upon the floor of a street car, although by falling between the slats of the wooden mat it had become entirely hidden, was a lawful tender of fare, which the conductor must not only accept, but supply the required change.



PLAN OF SUSPENSION BRIDGE, 3100 FEET CLEAR SPAN.
RECOMMENDED BY THE SECRETARY OF WAR.



THE PROPOSED GREAT SUSPENSION BRIDGE OVER THE HUDSON RIVER AT NEW YORK.

THE PROPOSED GREAT SUSPENSION BRIDGE OVER THE HUDSON RIVER, NEW YORK CITY.

We illustrate in the present issue the general plans for a suspension bridge over the Hudson River at New York City—by far the greatest bridge of the kind ever projected. The plans are issued by the New York and New Jersey Bridge Company, they being authorized by Congress, subject to the direction of the Secretary of War, to construct the bridge in question. The bridge is to extend from a location between 59th and 69th Streets on the New York side to the opposite side of the river in Union Township, N. J.

The plans are largely self-explanatory. The bridge will have a clear span of 3,100 feet—which is almost double the span of the Brooklyn suspension bridge.

The board appointed by the Secretary of War decided that it is probable for \$23,000,000 a six-track railroad suspension bridge of 3,200 feet span could be built, and it considered the amount of traffic that such a bridge would accommodate sufficient to warrant its construction.

The plans and specifications were prepared by Mr. Theodore Cooper, of this city, a member of the commission of expert bridge engineers appointed by President Cleveland, and who has since been retained by the bridge company.

The structure he proposes is a stiffened suspension bridge, the cables carrying only the part between the piers, the approaches to the main span being carried by deck trusses. The main span is stiffened by two through trusses, which may be either continuous for the entire span, or may be hinged in the middle. On the illustration the general dimensions are quoted. There is to be 150 feet head room, and, as will be seen, the river is left intact, no pier being established outside the regular pier line. The towers are to be of steel, commencing about 50 feet above high water, below which level masonry is used. The lateral and sway bracing of the main span and towers is to be of members rigid enough for compression, although some of them may normally be in tension. The general details, such as length of versed sine, the number of and the arrangement of cables, and the depth of trusses, are left to the bidders.

The main piers are to be carried down to rock; the foundations of the viaduct piers are left to the approval of the chief engineer. Quite an exhaustive list of strains allowed and of strengths and of coefficients in general are given. Thus for the wire in the cables a maximum stress of 54,000 pounds per square inch is allowed. In the usual construction of a suspension bridge the saddles which are on top of the towers are movable, being mounted on balls or rollers. The specifications for the proposed bridge provide that the towers and cables must be treated on the supposition that the saddles are or may become immovable. No closed forms are allowed on the bridge, all parts of which must be open for inspection. In other matters the same thoroughness appears. Thus rivet holes, if punched, must be punched too small and must be brought to a proper size by reaming.

Some space is given to the question of the cables. These are to be of straight steel wire, which must be not less than $\frac{1}{4}$ of an inch in diameter, and the wire may be twisted into ropes for compacting, or, as in the Brooklyn Bridge, may be formed by compacting the straight untwisted wires. The engineer notes that the unprecedentedly large diameter of the cables will demand that the inner strands of the cable be treated as a separate cable, around which the additional strands can be placed, squeezed, and wrapped. The wire must have a strength of 180,000 pounds per square

inch and elastic limit of 90,000 pounds per square inch, and an elongation of 4 per cent in a length of one foot. Each wire must be 1,800 feet long, without weld, joint, or splice.

Such are the general features of this structure—one which when completed will be at once a triumph of American engineering and an ornament to the city.

THE BIRDS OF THE CONGO.

To pass in review here, without the aid of numerous figures, all the types of the birds of the Congo that have been made known to us by the explorations of Messrs. Dybowski, De Brazza, Schwebisch, Thollon, Petit and others, would be an almost impossible task, and an enumeration of the Latin names that ornithologists have given a host of African species that are absolutely different from those of our own country

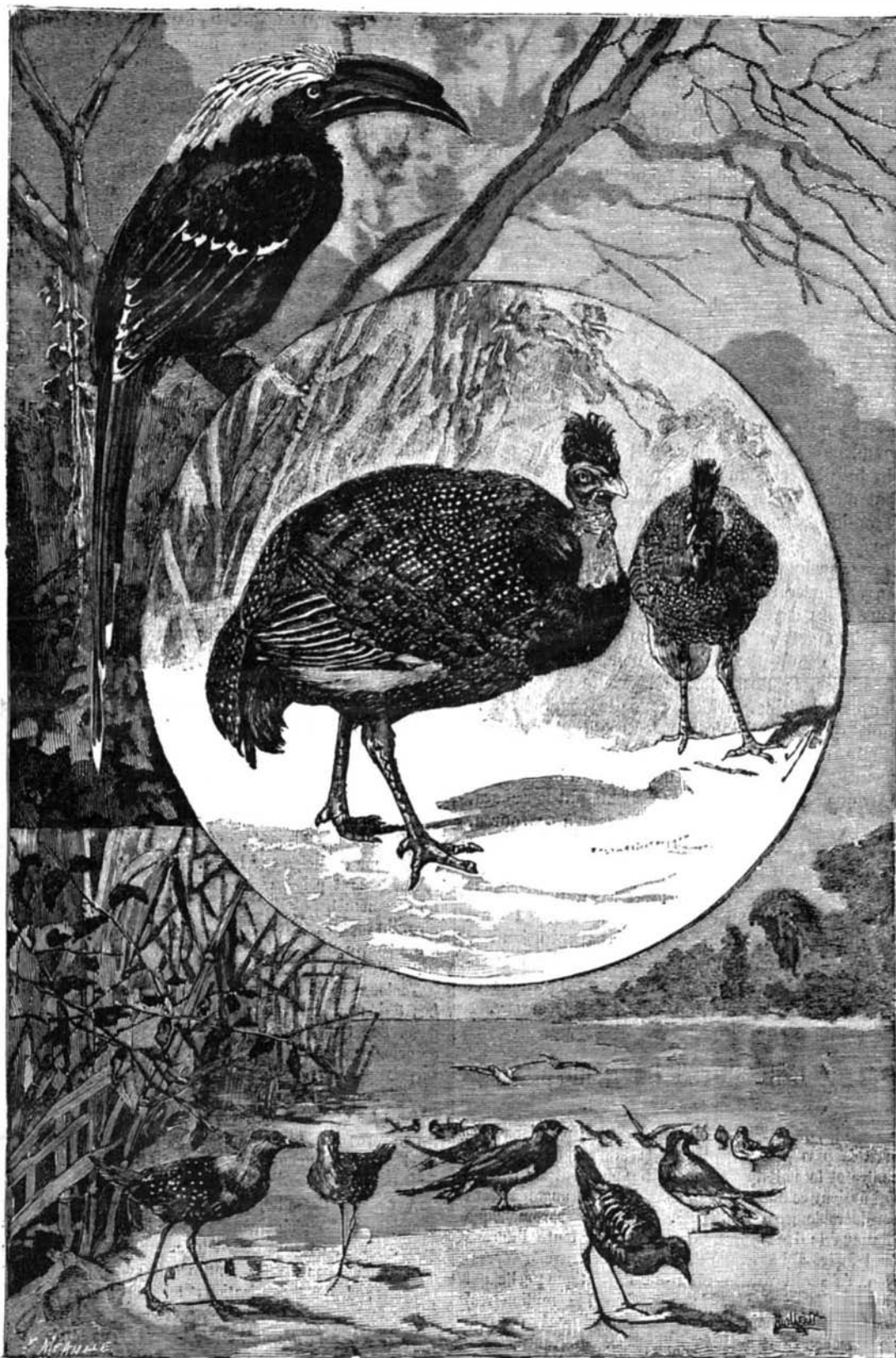
have lived at the Zoological Garden of London, has a proud bearing and feeds almost exclusively upon fresh meat. It is met with not only in the country of Angola, but in Congo, Gaboon, on the Gold Coast, in Portuguese Guinea and in Senegambia, where it is already becoming very rare. To the south it does not extend beyond the country of Mossamedes, and upon the east coast of Africa it has been observed but once, and that at a single point, the island of Pemba, to the north of Zanzibar. It is a bird, then, that is essentially characteristic of West Africa. We shall say as much of the Scotopelies among the nocturnal birds of prey. The Scotopelies belong to the same family as our great horned owls and may be compared thereto as regards dimensions, but they differ from them markedly by the absence of egrets on the head and by the aspect of their feet, the tarsi of which are bare, and the toes

of which are provided beneath with spiny papillæ, a feature that we observe only in the ospreys and the Asiatic horned owls of the genus *Ketupa*. Three species at least are known, which are distributed from Senegambia to the Quanza, and a single one of which, the same that inhabits Congo, has been met with on the east or rather the southeast coast, in the region of the Zambezi. They are accompanied in the west by the true horned owls, the scops-eared owls, the screech owls, common brown owls and barn owls.

In Congo the parrots are but slightly varied. Besides the gray parrot or jacko, which is observed with its squat varieties, there is hardly any but the green parrot with red forehead and shoulders (*Pæocephalus ubryanus*), which is everywhere rare, another species with yellow forehead (*P. Gulielmi*) and the small inseparable parrot (*Psittacula pullaria*), which is distributed throughout the whole of equatorial Africa. As for the banded parrot (*Ps. docilis*), so common in Senegambia, that does not descend so far as the basin of the Congo.

The other birds that Cuvier arranged in the order Scansores appear to be still more common in this region than the parrots, judging from the number of specimens belonging to the group of barbels, woodpeckers and cuckoos that figured in the collections received from the Gaboon and Congo by the Museum of Natural History. The barbels, which owe their vulgar name to the coarse hairs that clothe the base of the bill, which is laterally compressed and usually denticulate upon the edges of the upper mandible, belong to a dozen species of small size, and of dark brown, deep black or yellowish green plumage.

The woodpeckers make themselves remarked neither by their large size nor by the brilliancy of their colors. They are generally small and of green plumage, orna-



BIRDS OF THE CONGO—HORNBILL, GUINEA FOWLS, RAILLES, AND SEA PARTRIDGES.

would prove exceedingly tiresome to our readers. We shall therefore confine ourselves to making known those species that are most remarkable by their form or color, the most interesting from the standpoint of geographical distribution, or the most important as regards the profit that man can derive from them. Leaving aside from among the diurnal birds of prey the vultures, fish-hawks, buzzards, falcons, etc., we shall have a few words to say of the *Gypohierox Angolensis*. This bird of prey, notably smaller than an eagle, slightly recalls the latter and especially the *Perenopters* of Egypt by certain features of its physiognomy. In fact, a circle around its eyes and the sides of its bill and at its feet are bare and of a pale rose color, and its plumage, after having been brown, passes to pure white varied with black upon the wings and tail; but its strong bill denotes affinities with the eagles that are belied neither by the attitude nor the food of the bird. The *Gypohierox*, several specimens of which

mented with red spots, with stripes or with numerous white dots upon the lower parts of the body, but in the eyes of naturalists they offer great interest, because they belong either to species that have been recently described or are still rare in collections, or to species whose area of habitat was believed to be much less extensive. The same is the case with the wrynecks, those odd birds that have the curious habit of turning their heads in all directions and bristling their feathers when they are frightened. It was already known that the common wryneck (*Jynx torquilla*) remains in our country only during the summer, and emigrates toward the south before the end of this season. It had been found in Morocco, Algeria, Abyssinia, Kordofan, and even in Senegal, but it was not known that it descended as far as to the Congo. Mr. Dybowski discovered it in this region, where it is met with in company with one of its near relatives, the *Jynx pectoralis*, of Southern Africa, which advances in

an opposite direction on the side of the equator. The cuckoos present themselves in Congo under varied forms. Some belong to the category of golden and cupreous species that are so much esteemed as ornamental birds, and among which the foiotocole (*Chrysococcyx smaragdineus*) stands in the first rank; others to the category of coucals (*Centropus*), including species of large size with coarse and plain plumage, varied with brown, black and fawn color; and others to European species, such as the common cuckoo (*Cuculus canorus*), which rejoins in tropical Africa a species characteristic of the Ethiopian fauna, the *Ceuthmocaræ æneus* or bronze gray cuckoo. Finally, some of the cuckoos, and those are not the least interesting, belong to the genus *Indicator*, and one to the species *Sparrmanni*, which was observed more than a century ago, in Southern Africa, by Andre Sparrmann, the companion of Captain Cook, and the curious habits of which were described more anciently still by Father Lobo, a traveler in Abyssinia. According to Father Lobo and Sparrmann, whose assertions have been verified by Mr. Dybowski and other modern travelers, the *Indicator* or cuckoo or "honingwyzer" (honey guide) of the Dutch colonists, has the instinct (it would be juster to call it intelligence) of attracting the attention of the hunter by its cries, and, by flying before him, of leading him to the nest of wild bees, with the hope of obtaining a part of the booty. The *Indicators* are, in fact, particularly fond of the eggs and larvæ of the bee and of the adult bees themselves, and, when man is not there to lend them assistance, they address themselves, it is said, to the ratel (*Ratelus Capensis*), a carnivore related to the badgers, which actively hunts hymenopterous insects. In the woods in the vicinity of Franceville, trogons (*Trogon narina*) with golden green plumage and a bright red belly, like those that inhabit Angola, are met with, and the great forest of Mayombe, which seems to be uninhabited, so profound is the silence that reigns there during the greater part of the day, echoes toward night with the cries of the hornbills. We have not to sketch here the portrait of those odd birds with carnivalesque physiognomy, whose huge bill covers the entire face and is often further exaggerated at the top by a horny protuberance. Suffice it to say that some of these hornbills are of very large size, with a black bill, and plumage of a somber color, greenish black in the male and maroon in the female (*Ceratomygia*); others of smaller size, with yellowish bill, the plumage black and white (*Bycanistes*); others provided with a long tail and a tuft of white feathers (*Ortholophus*); and others, finally, of small size, with plumage varied with black, brown, and white (*Lophoceros*).

Being given the nature of the country, watered by two rivers, the Agowe and the Congo, broad streams like the Aubangui, the Sangha, the Alima, and a host of watercourses of less importance, one might predict that the regions traversed by Mr. Dybowski would be infinitely richer than our country in birds of the group of kingfishers. Such is the case, in fact, and we have counted at least a dozen species living between the equator and the sixth degree of south latitude. Several of these species, it is true, are not as strictly attached to the vicinity of water, and feed upon insects and small reptiles rather than upon fishes. These are the halcyons, easily recognizable by their large red and black bill and their azure or aqua marine blue plumage, set off with velvety black. On the contrary, the *Ceryles*, which are much larger than the European kingfisher, and have a piebald plumage, feed largely upon fish. They appear like true giants alongside of the *Corythornides* and the *Ispidinæ*, which are scarcely larger than wrens.

The bee eaters, which generally lay their eggs in galleries excavated in sandy banks along watercourses, and which pursue bees, wasps, and other insects through the air, are almost as numerous as the kingfishers in the basin of the Congo, where, besides the Nubian bee eater (*Merops Nubiens*) and the Angolan bee eater (*M. Angolensis*), we find the bicolored bee eater (*M. bicolor*), with rosy abdomen, and other species still more brilliantly colored.

Among the brilliantly colored sparrows, we may mention the blue, red, and lilac rollers, the tooracos and fly catchers, frugivorous and granivorous birds of the size of a jay; soui-mangas, which here, as in entire tropical Africa, play the role of humming birds; shrikes, with yellow or red breast; blue fly catchers; bronzed blackbirds, that have in reality nothing in common with the blackbirds, but which are true starlings, more sumptuously plumaged than ours, and, consequently, in much more demand in commerce and the feather industry. Let us not forget, either, the weaver birds, which suspend their artistically woven bag-like nests from the branches of the gigantic sycamores that grow upon the high plains. All these charming swallows, the astrilids, the bangalies, the widows and the cardinals, swarm in this region, whose tufted grasses furnish them with an abundance of food.

In addition to this brilliant assemblage, in field and forest, there flutters about a host of swallows of more

modest plumage—buntings, sparrows, larks, black, gray and ruddy shrikes, ravens, warblers, bustards, ousels, gray and brown fly catchers, daws, hoopoes, etc. During fine weather, drongos, swallows, and martins perform their evolutions in the air and give chase to the insects.

Equatorial Africa is much less rich in pigeons than certain islands of Oceanica. In Congo, however, we see doves with green plumage and partly naked face (*Trevo calvus*), banded turtle doves (*Turtur semitorquatus*), pretty doves, with wings marked with metallic spots (*Chalcopelia afra* and *C. Brehmeri*), and the iron mask doves (*Æna Capensis*). Our partridges are replaced by francolins, which sport amid the brushwood upon the plains and in swampy places where rushes and reeds grow; and in place of pheasants, there are beautiful pintadoes, some provided with a crest like the common Guinea fowl, and others having the head ornamented with a plume or a tuft of drooping feathers. These latter (*Numidia plumifera* and *N. cristata*) are replaced beyond Bangui by the crested pintadoes (*N. Marcheri*), which, according to Mr. Dybowski, do not extend to the north beyond the limits of the great equatorial forest. Everything leads to the belief that these pintadoes, which are very abundant upon the banks of the Congo and Oubangui, might be domesticated, as well as the francolins, and become barnyard fowls, much superior to the lean fowls of the natives.

Large bustards (*O. is Castra*) wander over the plains between the Oubangui and the Chari, whose shores are frequented by ædicnemes, gray and purple herons like those of Europe, by herons of still larger size (*Ardea Goliath*), by small bitterns, rails and jacanas. Anhingas (*Plotus Levallanti*), commonly called serpent birds, on account of their long flexible neck, nest in numerous colonies upon the high branches of the silk cotton trees that grow upon the banks of the Oubangui, while here and there, upon the banks of sand, sport ducks of different species; Egyptian ducks, plovers, lapwings, sacred ibises, pelicans, argils, etc. A few sea birds, crossbills, so called on account of the conformation of their mandibles, ascend the Congo as far as to Stanley Pool.

It will be seen that the fauna of the Congo is as rich as it is varied. Upon studying the elements of which it consists, we recognize therein in the first place a few special forms that have not been found up to the present in any other part of Africa, and then a large number of species that descend along the west coast from the Senegambia to the Congo, and even to the Portuguese possessions, and others which ascend, on the contrary, from the Cape to the Congo through Benguela and Angola. Another category is formed of species that may be qualified as equatorial, because they are found between the tropics, from the shores of the Indian Ocean to those of the Atlantic. Afterward come a few birds which, like the Egyptian goose and sacred ibis, seem to have come from the northeast, in passing from the basin of the Nile to that of the Congo, then an important group of species widely distributed through the entire African continent, to the south of the Sahara, and another group of cosmopolite species, and, finally, intermixed with the whole, a few European birds which we are surprised to meet with so far from their own country. Among the latter, we have already mentioned the gray cuckoo, the wryneck, the gray heron and the purple heron, and to these we may add the scops-eared owl, the black kite, the chimney swallow, the fauret, the warbler, the sylvan wagtail, the meadow titling, the stone chat, the shrike, the nightingale, etc. These birds are emigrants that come to take up their winter quarters in Central Africa, some of them in crossing the Sahara, and others in ascending the Nile as far as to its source, which is not very distant from that of the Oubangui, and in following this river up to the Congo. This latter way, which is longer, but easier, is perhaps the one most followed, since the celebrated Emin Pasha found to the north of the great lakes the same European species, accompanied by many others which doubtless do not push their migrations so far, and stop in the eastern Soudan.—Le Genie Civil.

A Cheap Substitute for Selenite.

BY HANS M. WILDER.

A set of selenite plates (generally three) is an indispensable adjunct to the polarizing outfit, because of the beautiful display of colors caused by their use.

Having on a certain occasion mislaid my selenites, I looked about for a substitute, and bethought myself of trying what mica, which is stated to possess similar light-retarding power as selenite, might do. To my agreeable surprise, mica (the common stove door kind) proved to be equal to any ordinary selenite, the colors being quite as handsome. Mica possesses two advantages: It is much cheaper, a piece three inches square costing about two cents, while a selenite (the usual size of which is $\frac{5}{8}$ of an inch) costs from one dollar up, and mica can be cut with scissors and handled without much fear of breaking it. The best way to proceed is as follows:

Put a slide of any polarizing substance (starch for

instance) on the stage of the microscope, having previously put the two nicols in their places, and slip a piece of mica under the slide. Some kind of color will be observed. If not satisfactory or especially handsome, give the mica a slight turn around its axis, and try in this way whether in any position a satisfactory color is obtained. When found, cut one end square so as to be parallel with the slide; by always slipping in the mica in the same way, the same color display will be obtained, since the retarding power, and consequently the color, varies with the thickness. Quite a variety of beautiful color effects may be obtained by either using mica plates of varying thickness or by merely using two or more layers of thin plates superimposed. The colors may be varied still more by altering the relative positions of the superimposed plates; in fact, three plates of varying thickness will be all that are necessary to keep. As stated before, mica costs next to nothing. If, therefore, the first piece does not suit, throw it away and try another. Select the clearest pieces. The mica plates may be cut and mounted to suit. Personally, I prefer strips about $1\frac{1}{2}$ inches wide, and somewhat longer than the stage from front to back, so as to be easily slipped in under the slide, and as easily removed.—Am. Jour. Pharm.

Street Car Compressed Air Motor.

The Rome (N. Y.) Daily Sentinel gives an account of the recent trial in that city of the Hardie air motor. A number of prominent street railway men, from various parts of the country, were present.

Robert Hardie, inventor of the motor, directed its operation. Mr. Stebbins, of the draughting department of the works, assisted in giving the visitors information. The trial was made on the 800 feet of rough track in the yard of the works, with Engineer Williams at the lever. The car started out with 1,800 pounds of air pressure to the square inch and a temperature of 310 degrees on its hot water tank, which is used to great advantage in heating the air before it passes at reduced pressure to the engine cylinders. A valve constructed for the purpose reduces the pressure of the stored air to 140 or 150 pounds, and this is the working pressure, or the pressure at which the air enters the engine cylinders. The motor starts gently, runs smoothly at a rapid rate and stops by air brake without jerk or jar. It was run back and forth repeatedly for upward of forty trips, and the test showed that under the conditions applied the motor would run twelve miles from one charging of compressed air, and make seventy stops.

The method of recharging the storage cylinders with compressed air was shown. It is a very simple operation, and, with the flexible couplings contemplated for the purpose, the recharging of a car with power need not occupy more than a minute or two. The same is true as to recharging with hot water, and the two can be done at the same time. The temperature of the hot water tank, covered with asbestos, on the occasion of the trial, was reduced from 310 to about 200 degrees in one working hour. Under more favorable conditions, especially in summer, this reduction would be much less, probably not more than half as much.

The Hardie motor and car are hung on elliptic springs, and the ease with which the car passes over wide joints, frogs or imperfections in the track is something admirable. This very important feature attracted the attention and favorable comment of the inspecting visitors from the East, all of whom know too well the terrible pounding that the trolley car gives the railroad track, because, like the lumber wagon, it is absolutely without springs. In this respect the Hardie motor indicates a sure and great saving in wear of rails and cars, while affording the utmost ease to passengers riding.

The principles of the Hardie compressed air motor are apparently above criticism. In the initial machine there are one or two minor respects—one the escape of vapor on a cold day like the breathing of a horse—in which the motor will be improved, without any difficulty, until the car shall appear as a noiseless, breathless vehicle that glides over the iron rails more smoothly than any heretofore produced, while under the most perfect control in starting and stopping.

The visitors were very much pleased with what they saw of the Hardie motor, and they watched and inspected and tallied it very thoroughly. As a result of their visit they have negotiated for the construction of six to ten of the motors to be used on Eastern lines. The order is upon certain conditions, one of which is the introduction of Pintsch gas light into the cars. This, Mr. Hardie says, can easily be done, and any other mechanical requirements can easily be met.

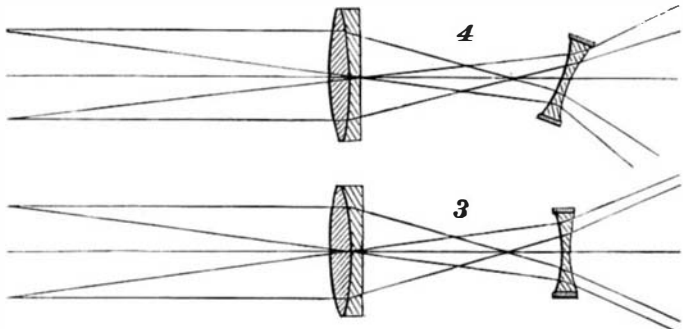
The air motor can be used on the simplest kind of a track. No trolleys or cables are necessary and the great expense of overhead or underground fixtures and the cost of great power plants are avoided. Besides, the economy of compressed air is greater than any other power. In electricity 60 per cent is lost; in compressed air but 20 per cent. An equipped street railway that for air motors might cost \$10,000 a mile would cost many times that amount for any other system.

THE AUTO-PHORO-OPTOMETER.

This is an optical instrument designed for correcting errors of refraction in the human eye, and disequilibrium between any pair of its muscles.

The difficulties encountered, the profound knowledge required and long practice absolutely essential to the scientific prescribing of spectacles are little understood by the public and appreciated less.

Most persons suppose that "glasses go by numbers," and buy them as they would a pair of boots. Comparatively few consult an oculist or a prescribing op-



COURSE OF THE LIGHT IN THE AUTO-PHORO-OPTOMETER.

tician, but those who do get their "views enlarged" in more senses than one; they learn with surprise that lenses must be made especially for them; they get a general idea of astigmatism, yet wonder how it is that a single eye may require a lens stronger in one diameter than in the others, and can scarcely believe that an eye may be "near sighted" in one diameter and "far sighted" in another. As to muscle troubles, few people know that prisms are prescribed mounted in spectacle frames.

Those who have sat in an oculist's chair and sub-

roughly under control of both the patient and the operator as to be susceptible in a moment to very "fine" adjustment. Primarily the instrument is a small telescope mounted upon an upright stand. The lenses are those common in opera glasses, with the difference that two auxiliary interchangeable eyepieces are used in correcting myopia (near sight), and the minus lens of the ordinary eyepiece is so arranged as to tilt upon an axis at right angles to the principal optical axis or line passing from a distant object centrally through both lenses. This eyepiece, a, also revolves in common with the disk, A, so that it can be tilted in any plane, i. e., at any angle from 0 to 180. The tilting of this lens is entirely new in optics. The aberration so caused has been recognized only as a thing to be carefully avoided in the placing of lenses in optical instruments. That the tilting of a lens of certain power at a given angle is equivalent to the employment of a cylindrical lens, the inventor claims as the discovery of a new principle, doing away with the employment of a multiplicity of lenses and yet indicating them all, and rendering the correction of astigmatism as simple as the measuring of liquids.

Those familiar with the subject will find no difficulty in understanding the remaining parts of the instrument. In testing for hypermetropia, the draw tube is closed, 0 being indicated on the outer circle of figures, which are white; on revolving the disk, B, an outward movement is communicated to the draw tube, which can be opened to the extent when +10 are indicated. Should the case be one of myopia, one of the auxiliary eyepieces, -10, is used, and the values are indicated on the inside scale (red) of the disk, B, which is revolved in the opposite direction from what it is in testing for hypermetropia. Should the case be one exceeding -10, then the other auxiliary eyepiece, -20, is used, so that the entire range of the instrument is from +10 to -20 for the distance type, printed with appropriate type to allow for the magnifying power of the instrument, which practically is not a disadvantage.

Muscle testing by the phoro-optometer is exceedingly simple, and is based on the principle of decentering, esophoria and exophoria being indicated by the pointer and scale on disk, C, and hyperphoria on the quadrant, D.

The most important claim for this instrument is that it requires no skill and that any one of average intelligence can do as accurate work with it after the third day as the most accomplished optician with the old trial case can do after as many years, and in one-tenth of the time. In the words of the inventor, "What steam is to travel, what the telephone is to speech, is the auto-phoro-optometer to dioptries." A very important point consists in the fact that the instrument forms with a screen an excellent artificial eye, invaluable to the student. Fig. 3 shows the course of the rays in a Galilean telescope or opera glass, and Fig. 4 shows the effect on the light beam of tilting the negative or eye lens. In the

position shown it becomes practically a negative cylindrical lens.

Business communications regarding this instrument may be addressed to Mr. A. G. McKenzie, optician, 156 Charles Street, Boston, Mass., who has acquired an interest in the invention.

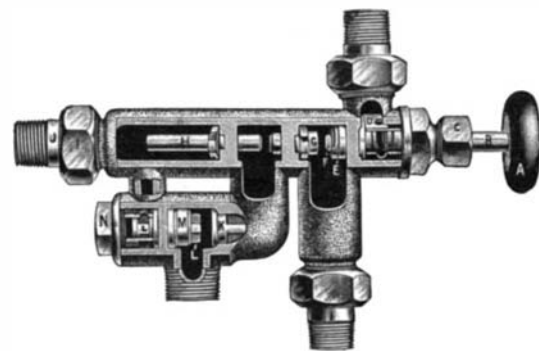
THE INTERNATIONAL INJECTOR.

We illustrate herewith in perspective and sectional views a new injector for which the makers claim most excellent results. It has been designed to combine all the good features of both automatic and positive injectors of the past, and is claimed to surpass both in working qualities. The principal new feature in the International is the fact that the current of water to the boiler is established against atmospheric pressure instead of against direct boiler pressure as heretofore. This is accomplished by the combination of overflow valve, K, and pressure valve, L. When the injector starts, the steam passing through the steam jet, F, and suction jet, G, passes down through the overflow chamber, forcing valves, K and

L, away from their seats and opening the passageway through the overflow for the escape of steam, which by its pressure against the valve, H, holds both valves away from their seats.

A vacuum being created between jets, F and G, the water is lifted, and passing through the suction jet, G, and combining and delivery jet, H, on its way to the boiler, passes down through the secondary overflow, and out through the passageways between pressure valve, L, and pressure valve collar, M. As the pressure increases in the delivery chamber around the delivery jet, H, valve, L, is gradually forced to its seat against the collar, M, but does not finally close until the current to the boiler is firmly established. The valve, K, in the meantime is closed by the vacuum in the overflow chamber. By a new construction of the parts in the steam chamber, the same valve handle, A, opens valve admitting steam to the injector, and at the same time regulates the amount of water supply, therefore no valve is required in the suction pipe, nor is one necessary in the steam pipe except as a convenience, should it be desired to remove the injector at any time while carrying steam on the boiler. The combination and delivery jet, H, has no spill holes.

The makers claim for this injector that it will start at 13 to 15 pounds steam pressure and work from that point up to 250 pounds steam pressure, giving it a range of 235 pounds, and that it is automatic and re-starting at any and all pressures. It lifts the water vertically 20 to 22 feet, and handles a hot water supply



INJECTOR-SECTIONAL VIEW.

of 135 degrees at 65 to 80 pounds of steam, 125 degrees at 125 pounds of steam. By delivering the minimum capacity it will put water into the boiler at 200 degrees at 80 pounds steam, and at 260 degrees at 150 pounds to 200 pounds of steam, the water being taken from a 4 foot lift at 74 degrees.

The parts are made interchangeable and are all easily accessible for cleaning, and the injector is fully guaranteed. It is manufactured by the World Specialty Company, 113 Seventh Street, Detroit, Mich.

The Columbian Exposition Awards.

The Director of the Mint says that the medals which were awarded to the exhibitors at the Columbian Exposition of 1893 will be ready for distribution about June 1. The superintendent of the Bureau of Printing and Engraving says that the diplomas will be finished about the end of March. The long delay has not been borne very patiently by those who are to receive the awards, and was caused by the rejection of the design for the reverse of the medal by the Quadro-Centennial Committee. The medal was designed by the sculptor Augustus St. Gaudens. After its rejection, a new design was prepared by Charles E. Barber, of the United States Mint, so that the medal as issued will be the joint work of Messrs. St. Gaudens and Barber, the former doing the obverse, the latter the reverse. The 23,700 bronze medals are to cost \$30,000. If, however, any exhibitor should prefer a gold medal he is authorized to have one, provided he pays for the gold himself. The medals will all be alike, except for the names of the exhibitors inscribed on them. The diplomas will be about 22 by 18 inches in size, and the design was made by Will A. Low, an artist of New York City. It will be a fine example of the engraver's art.



AN AUTOMATIC INJECTOR ADAPTED TO WIDE RANGE OF PRESSURE.

DR. HUNTINGTON'S AUTO-PHORO-OPTOMETER.

mitted to the tests in vogue remember the experience as extremely tedious, disagreeable and expensive. The "trial frame" is a trial indeed, and as the many lenses and their combinations are tried and changed the patient's eyes become so strained and fatigued that his answers are very unsatisfactory, and the result is often an imperfect "fit," even though the oculist be a man of unquestioned eminence and ability. Such a man will not deny the truth of this paragraph. What then are the chances for accurate work at the hands of a "prescribing optician"? He has not the thorough knowledge of the oculist. He is a busy merchant, and besides he charges no fee for his examination and cannot devote much time to the case. Yet the prescription work done by opticians to-day is largely in excess of that which reaches the oculists. In fact a new profession—a very profitable one—is rapidly growing up, and seems destined to take its place by the side of dentistry. It is ably represented by the most advanced opticians, many of whom prefer being known as "refractionists." A notable movement has recently occurred in Boston, where the New England Association of Opticians has been successfully inaugurated, with a large and constantly increasing membership.

The instrument here illustrated has been exhibited at one of the meetings of the New England Association of Opticians by its inventor, Dr. Homer A. Huntington, who in an able lecture demonstrated the correctness of its principles and the simplicity and rapidity of its action. It is so nearly automatic and so tho-

Apoplexy.

We make the following brief abstracts from an interesting article in the Medical Record by Charles L. Dana, M.D., of New York City, entitled "Some New Observations upon the Causes, Mode of Onset, and Prognosis of Apoplexy."

Many writers have based their statements upon statistics which have been handed down from the now somewhat venerable records of French and English hospitals and from the systematic writers on this subject of half a century ago. In this country, at least, there has not been, so far as I know, any extended critical analysis of large numbers of cases of cerebral hemorrhage or of acute softening.

The total number of cases I have utilized for study is 182, of which 100 were non-fatal and 82 fatal.

One-third of the cases are in females, and the special apoplectic age is between forty and fifty years. Three-fourths of all adult apoplexy occurs between the ages of thirty and sixty, being pretty evenly distributed between the fourth, fifth, and sixth decades. If one were to leave out syphilitic cases, however, we should find that the most serious decade was that between the fifty-first and the sixtieth year. After the age of seventy apoplexy is relatively rare and is little to be feared.

Taking hemiplegia as a whole, I find that a very distinct history of syphilis was found in 36 out of the total 100 non-fatal cases. In 4 the attack was due to the puerperium; in 1 it followed typhoid; in 5 the patients worked in lead or were painters; in 1 there was Bright's disease; in 5 there was a severe cardiac trouble; in 5 the patients were drivers and heavy drinkers; in 10 others exposure and heavy drinking were striking elements in the history.

This accounts for two-thirds of the cases, one of these thirds being syphilitic. This fact that syphilis causes one-third of all cases of apoplexy has not, I think, been heretofore brought out, though I feel sure that the experience of neurologists will confirm it.

If a person has not had syphilis and is not a drinker, the chances of his dying of apoplexy are very greatly lessened. The remaining one-third of the cases has still to be accounted for, and this third includes, for the most part, I believe, cases of intercranial hemorrhage, rather than softening. The most important factors here are heavy eating, with insufficient exercise, and some congenital tendency to arterial disease due to a gouty or rheumatic diathesis. Excessive mental work does not lead to apoplexy, and brain workers do not die of this disease unless they are intemperate in eating, drinking, and perhaps in smoking, though on this latter point I feel doubtful. Two of my cases only gave a history of excessive use of tobacco as the sole predisposing cause. It is often stated, and is commonly believed, that one attack of apoplexy predisposes to another, and that a person who has had a vessel broken or occluded is extremely liable to have a second attack within two or three years, but the frequency of repeated attacks seems from a study of my cases to be much exaggerated.

It is, I have no doubt, the experience of many that persons who have had a moderate attack of cerebral hemorrhage may live for many years in fairly good health.

The conditions of modern civilization undoubtedly are tending to increase the number of cases of apoplexy, particularly those due to rupture of blood vessels. The fact that under better sanitary conditions more people reach the apoplectic age is one cause of this. The gradual lessening of the number of acute infectious fevers and the consequent lessening of mortality from such diseases increase the proportionate number of deaths due to diseases of the arterial system; in fact, the stress of modern civilization shows them more, so far as organic disease is concerned, upon the arteries than it does upon the nervous system. The increased opportunities for indulgence in luxurious modes of living, and in excessive eating and drinking, tend to impair the integrity of the coats of the arteries, and to promote conditions of arterial fibrosis. Already this fact may be demonstrated by the statistics of our great cities, as well as deduced from the known laws of pathology.

In New York City the deaths from apoplexy and paralysis have increased from 314 in 1866 and 272 in 1867 to 1,194 in 1892 and 1,171 in 1893.

The deaths from these causes between the ages of twenty-five and sixty-five have increased from 219 in 1866 and 197 in 1867 to 939 in 1892 and 931 in 1893.

Here the deaths from apoplexy and paralysis have quadrupled, while the total death rate has increased from about 25,000 to a little over 40,000, i. e., it has about doubled.

As to the exciting causes of attacks of apoplexy, some misapprehension apparently prevails. We all know that many fatal cases occur in persons who have been on a drunken spree, and that of all exciting causes of fatal strokes alcohol is the most potent. On the other hand, in my experience very few attacks take place, as is currently supposed, during some especial mental or bodily strain.

The frequency with which attacks occur in the morn-

ing after breakfast, or in the evening, is somewhat noteworthy. Few cases occurred in the middle hours of the day.

The apoplexies are increasing in disproportionate frequency, owing partly to the facts: that more people live to the apoplectic age; that there is a larger urban population, with all that that implies in regard to the use of alcohol, the prevalence of syphilis, and the greater intemperance in eating and working.

Apoplexy does not especially affect brain workers if they live temperately, but rather spares them.

Apoplexy is sometimes a conservative agent, calling a halt to excessive activity and intemperate living, and actually prolonging life.

About one-fourth of those stricken with apoplexy die from the attack (hemorrhages being the most dangerous, thrombosis, especially syphilitic, being least so).

The average duration of life of those who have and survive one attack is over five years. The chances of a second attack before the fourth year are always considerable, yet do not amount to fifty per cent, and are inconsiderable so far as hemorrhages are concerned. Thromboses are much more apt to recur than hemorrhages.

The Production of Camembert Cheese.

The popular small cheeses made in France and Germany, but used everywhere, being largely exported from these countries, are divided into two classes—one is used within a few days after the making, the other being cured for later consumption. It is plain that the latter description of cheese is more suitable for extensive manufacture on this account than the older kind, known as fromage frais, and, on account of the greatly improved quality, the cured ones are known as fromage fin. This term is fully justified by the most careful process of curing, by which the sharper ammoniacal taste and odor are got rid of, and a soft, rich, buttery consistence and a pronounced and pleasant flavor are given by the slow and careful curing. It is a noteworthy fact that this method of curing, which has been in use for more than a century and has been slowly evolved by gradual experience, is based on the most correct scientific principles. A typical cheese of the cured kind is the Camembert, so called from the place of its original manufacture, where it was first made in the year 1791 by a dairyman named Peynel. The manufacture now amounts to several millions of cheeses annually, and employs the whole population of this district. The method of manufacture of this popular cheese is exceedingly delicate and demands the greatest care in the most minute details, beginning with the milking of the cows—indeed, before this, for the feeding and lodging of them are fully considered in respect of the avoiding of everything that might interfere with the perfect purity of the milk and the preservation of all the fine qualities of the pasture of this especially favored district. This extreme care accompanies all the work in the dairy until the milk is finally and carefully strained. The milk having been drawn, is strained immediately, and is set apart for three hours for the cream to rise. There is then a thin pellicle of cream on the milk, which is removed and churned into a very fine quality of butter. The milk, for the convenience of the special manipulation, is set in broad earthen jars, each holding five or six gallons, and, as each has been skimmed, it is set on a heater and warmed until the common well-known pellicle or skin forms on the surface and wrinkles or creeps as it is called. The temperature at which this happens is somewhat over one hundred degrees. The rennet is then added, one tablespoonful to each jar of milk, in which there are twenty liters, equal to about twenty-one quarts. The rather high temperature of the milk when the rennet is added brings the curd quickly, and at the end of five or six hours each jar is set on a low bench, in a sloping direction so as to bring the contents to the extreme edge, and the curd is then dipped out into the moulds, which are of cylindrical shape.

These moulds, made of pure tin, are twelve centimeters or four and three-quarters inches high and wide. They are open at each end and are set on mats of rushes sewn together. The moulds are filled with the curd, from which the whey drains through the rushes on to the sloping table, around which a groove is cut to carry it to the drain by which it flows away. As the whey drains from the curd, this shrinks in volume until the cheese has gained sufficient consistency to be handled out of the mould, which is at the end of the second day. They are then taken out of the moulds and sprinkled with salt and left on the mats three or four days longer. They are then placed in shallow wooden boxes with handles and are in this way removed to the drying room. Here they are arranged on frames, of which there are several tiers, and are exposed to a free circulation of air regulated by swinging shutters. These windows are not glazed, but they are protected by fine wire gauze to keep out the flies, and, as the direction of the wind varies, so the shutters are opened or closed fully or partially in such a manner as to direct the air currents over or under

the cheeses lying on the lathed frames, through which the air has complete access to the cheeses. Here they remain from twenty to twenty-five days, according to the weather. They are then removed on large movable shelves to the curing cellar, where the circulation of the air is much increased by the management of windows similar to those previously described and the shutters fitted to them. At this time the fermentation in the cheese begins to throw off moisture which gathers on the surface of the cheese. At this stage the cheeses are removed to the finishing cellar, in which the windows are glazed and protected by inside blinds. In this place the cheeses remain a month or less, as the ripening may progress slowly or rapidly. During this time they are turned once in forty-eight hours. This constant turning is a special process for the fullest exposure of the cheeses to the air, and is practiced all through the curing, gradually increasing the time of the turnings if the ripenings may be proceeding too quickly. At the end of the term the cheeses are complete, and are packed in paper and put into boxes. They are then packed into wicker baskets and sent to market. They weigh about eight ounces and sell for about one shilling and sixpence each. The finest selected cheeses are sent to special customers who pay one-fourth more. The prices vary as the season or the demand and supply, but usually they remain about the same for years. Such a desirable cheese as the Camembert is, of course, imitated and sold at a less price, but on account of the strict way the French government has of controlling such things, the imitation is sold for what it really is, as fromage façon Camembert, which does not deceive the purchaser in any way.—Journal of the Society of Arts.

The Astronomical Programme for 1895.

C. A. YOUNG.

The astronomical programme of the year, so far as it is a matter of prediction, offers nothing of exceptional rarity or interest.

The number of eclipses is somewhat larger than usual, but three of the five are only small, partial eclipses of the sun, and are all invisible in the United States. The two eclipses of the moon, however, which occur on March 10 and September 3, are both total, and are both visible in this country from beginning to end. The first of them is also observable in Europe, and will therefore afford an opportunity for co-operative observations of the occultations of small stars that lie in the moon's path while it is obscured—observations which are of great value in determining the distance of the moon and the form and size of the earth. This year, also, the moon every month passes over the Pleiades, and their occultations possess the same value if observed at widely separated stations.

The sunspot maximum was reached two years ago, and the activity of the solar surface is now declining, so that there is no reason to look for any phenomena of special interest in that quarter for the present.

As for the planets, Mars is already far away, and for more than a dozen years will not again be as favorably situated as he was last autumn. Saturn is far to the south, and even at his opposition in April and May will be too low down for satisfactory observation. During the first three months of the year Jupiter, on the other hand, will be admirably placed and will monopolize the interest of observers; and during the spring and summer Venus will be splendid in the evening sky.

The only periodic comets whose return is due this year are Encke's and Brorsen's. The former, which completes its orbit every three and a third years (the shortest comet period known), came in sight early last November, but does not reach its perihelion until February, and is still under observation. It is very faint, seldom becoming visible to the naked eye, and the chief interest that attaches to it lies in the strange continual shortening of its period, a phenomenon which still remains without any certain explanation, though very generally supposed to be due to its collision with some invisible meteoric swarm. Brorsen's comet, which made its last visit in 1890, and has a period of five and a half years, is due again next summer; but it is unfavorably situated, and will be so faint that it may very possibly elude observation.

Of course, it is perfectly possible, and much to be desired, that some great comet may appear entirely unannounced, or that some "newstar" may unexpectedly burst into brilliancy; but such phenomena do not come within the range of our prediction.

Probably before the close of the year the immense forty-inch telescope of the Chicago University will be erected in the magnificent observatory now building for it at Lake Geneva, Wisconsin; and it is possible that by that time the great instrument now being constructed for the observatory of the Cape of Good Hope may also be mounted, so that hereafter the southern hemisphere may possess at least one instrument comparable in power with those that are now so numerous in the northern. And yet, after all, the real progress of astronomy depends more upon the unobtrusive, faithful, laborious work of the mathematicians and routine observers than upon big telescopes and sensational discoveries.—Cosmopolitan.

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR COUPLING.—Clement Mire and Paul Judice, Jr., Donaldsonville, La. The drawhead of this coupling may be of the ordinary form, and the coupling bar has at each end an arrow-like head adapted to engage pivoted coupling hooks, which are arranged in pairs in each drawhead, adjacent to pivoted detachers. The latter are formed with ejecting portions for forcing the coupling bar out of engagement with the coupling hooks, and the coupling hooks have rear arms engaged by operating levers with connections which may be extended to the top or side of the car.

SWITCH.—John M. Perkins, Brooklyn, N. Y. This inventor has devised a switch of simple and inexpensive construction, the actuating devices acting directly upon the switch point, the movement of which may be effected from a moving train. In connection with outer and inner guards adjacent to the main rail and the switch point, in a block at each side of the latter, is pivoted a somewhat crescent-shaped lever, the levers engaging opposite sides of the switch point, and being adapted for engagement by any trip which may be pressed downward from a moving train. To locate the shifting device centrally between the track rails, a shifting tongue is pivoted on a plate between guards, in each of which a triangular lever is pivoted, the free end of the tongue being connected by a link with the switch point, and the movement being likewise effected from the train.

SWITCH.—William L. Geisler, Hempstead, N. Y. This improvement is especially adapted for street railway service, the switch being readily shifted by an operator on a moving car. A switch tongue is pivoted on a slotted cover plate, two pivoted bent levers extending through the slots, while a pivoted tilting arm supported from the plate has near each of its ends an anti-friction roller, there being a connecting device between the tilting arm and the switch tongue. In a bracket depending from the car are held rollers which may be depressed by foot pressure on a presser bar at either side to throw the switch tongue in the direction desired to switch the car from one track to another.

Electrical.

CONDUIT RAILWAY.—Michael F. Flynn, Stamford, Conn. According to this improvement a small surface conduit on which is the trolley rail carries the live wire in such a way as to prevent grounding and loss of current, tilting levers being arranged below the live wire to carry it upward against contact screws, while an operating mechanism extends up through the conduit whereby the levers are actuated by a passing trolley. The construction is very simple, and the trolley rail is entirely out of circuit except the moment that the car is in connection with a certain section.

Mechanical.

CENTRIFUGAL PUMP.—Warren P. De Remer and Josiah Peeper, Western Union, Wis. This invention provides self-adjusting movable nozzles on the ends of the pump discharge pipes, the arrangement being such that the priming-holding nozzles automatically adjust themselves to securely hold the priming in place until the centrifugal force becomes greater than the atmospheric pressure, and then permit a free and natural escape of the water without undue friction and resistance, effecting a saving in the power required to drive the pump.

MACHINE FOR TAPPING MAINS.—John Hearne, New York City, and Elmer E. Cisco, Brooklyn, N. Y. This is a gas-tapping machine, adapted to be fastened upon a pipe for drilling, reaming, and tapping a hole without allowing any gas to escape, the tapped hole being closed by a plug. It has a hollow, exteriorly threaded body adapted for air-tight connection with the pipe, there being a feed mechanism and a tool operated therefrom in the hollow body, and a hand wheel screwing on the exterior screw thread of the body. The machine is light and strong and may be readily applied to and disconnected from a pipe.

Agricultural.

CULTIVATOR.—Horace S. Overstreet, York, Neb. This is a machine for cultivating an unplanted field, serving substantially as a harrow, or it may be employed for cultivating two rows of corn at one time. It has gangs of cultivators which may be independently raised or lowered, the outer gangs adjusted as to depth and the intermediate gangs serving as a drag, and its draft mechanism is so arranged that the poles may be directed to the right or left, causing the team to properly guide the machine. The gangs of cultivators are firmly held, so that they will not have lateral movement, and a draft equalizer is utilized, whereby undue tension will be removed from the team, the three horses employed each drawing equally.

MOWING MACHINE ATTACHMENT.—William C. Carlton, Rockville, and Charles H. Seebree, Caldwell, Idaho. This is a cutter attachment, applicable to an ordinary mower or reaper, in which a vertically reciprocating cutter bar is arranged at the outer end of the ordinary horizontal cutter or sickle bar. In its operation, while the machine is moving in the ordinary way, the vertically reciprocating cutter divides the grass at one end of the main cutter or sickle, so as to leave the swath clear and well marked, the grass being cut vertically at the end of the main finger bar, obviating the difficulty experienced with the ordinary mowing machine, where heavy grass drops down over the swath which has been cut.

Miscellaneous.

CARBURETOR.—Harry B. Cornish, Hampton, Iowa. For carbureting air, that it may be burned as a gas for an illuminant, this inventor has devised a simple apparatus for use in connection with a gasoline tank, to incorporate with the gasoline a volume of air, the apparatus being safe and easily controlled. An upper gasoline tank is connected by a valved pipe with a lower tank, to which air is supplied under pressure, the gasoline dripping down through the pipe by gravity to the lower pipe, passing through a series of screens in the

lower tank, and both tanks being connected by a valved pipe arranged to maintain an equal air pressure in both the upper and lower tanks, there being an outlet for the carbureted air in the pipe connecting the tanks.

DISTILLING AMMONIA.—Samuel J. Whiteside, Savannah, Ga. An apparatus for use in connection with absorption ice machines has been devised by this inventor, whereby the ammonia is economically and thoroughly rectified before being expanded into the bath, and the boiler feedwater raised to a high temperature, thus saving fuel. The apparatus comprises a stack of three sets of novel rectifying pans in a rectifier set on top of the ammonia boiler, and is provided with a heater through which passes the feedwater under boiler pressure, there being in the heater a steam coil connected with the heating coil in the ammonia boiler, a second coil for the ammonia gas and connected with the rectifier, and a third coil connected with the weak ammonia in the ammonia boiler.

COAL DISCHARGING TRAMWAY.—John B. Honor, New Orleans, La. This is a sectional construction, which may be set up anywhere and made as long or short as required, being primarily adapted for unloading coal from steamers along a river front. The dump cars for operation in connection with the tramway are so connected with a winch that, when one car has been unloaded, a return of the empty car will cause the loaded car to travel to its destination, the cars being automatically dumped on reaching the desired point and held open until all of the contents have been emptied.

WINDMILL REGULATOR.—Richard T. Skinner, Eldora, Iowa. This is a simple and positively working apparatus governed by the movement of a float, the lowering of which sets the windmill and pump working, while its raising throws the mill out of gear, the movements in both cases being gradual and easy. An arm projecting from a ratchet wheel engages a controlling wire of the mill and an oscillating lever is connected with the pump rod, a pair of pawls on opposite sides of the fulcrum of the lever being adapted to engage the ratchet wheel, while a notched tie bar connects the pawls and a tilting latch is adapted to engage the notch of the tie bar and hold the pawls released. A swinging float-controlled lever strikes and releases the latch.

DEVICE FOR DRAWING ALE.—Charles G. Reers, Jersey City, N. J. This improvement is designed to facilitate the drawing of ale in a glass without foam. A suitable receptacle is divided by partially perforated partitions into three compartments, the upper one normally for gas, the second one for foam, and the lower and larger one for the solid ale. The middle compartment is connected by pipes with supply casks of ale or with the ale pump, so that the ale passing down to the lower compartment will be almost without foam, and from low down in this compartment a pipe having a draw faucet is extended to the bar. The upper compartment is provided with an air and gas vent, to be opened from time to time as may be necessary.

PAPER PERFORATING MACHINE.—Clay W. Holmes, Elmira, N. Y. This invention relates to slot perforators in which a circular female die has a peripheral slot receiving a series of short cutters carried by another circular die, to punch elongated slots in straight line series from a sheet of paper. The improvement provides for a series of clearing blades arranged to run in the slots of the female die in tangential position, being adjustably held therefor by means of collars on a countershaft. These blades may be applied to any set of dies working on the continuous slot principle, and operate to effectually remove the little bits of paper cut out, which tend to pack in the slot so as to stop the operation of the machine.

ATOMIZER.—Albert Heinz, Brooklyn, N. Y. This is a simple device designed to be especially serviceable to physicians desiring to spray an affected part of the body for a short time only, in cases where only a single spray is required or desirable. It is arranged to cause the spray to cease immediately whenever the operator releases the pressure on the bulb, the liquid in the discharge nozzle then receding slightly from the orifice.

BICYCLE LANTERN BRACKET.—John C. Wells, East Hampton, Conn. This device comprises a length of wire doubled upon itself and bent outwardly at its closed end to support a lantern, a clip having eyes at one end receiving the bracket arms, while at its opposite end is a swinging bolt with a saddle, a nut clamping the saddle on the bracket ends. The device is very simple and may be readily adjusted to various sized heads or quickly detached therefrom.

LAMP BURNER.—Daniel T. Fox, Mount Pleasant, Pa. This invention relates to burners formed in two sections, one section carrying the wick tube and the other the chimney, and provides means for conveniently adjusting the top section to an elevated position and locking it there. By means of a lever pivoted to the lower section a combined lifter and prop may be made to elevate the upper section and chimney so that it will not accidentally drop as the lamp is being lighted or extinguished.

DUST PAN.—Kent W. Gress, San Francisco, Cal. This pan has a long handle which may be adjusted for different positions by means of a spring wire connected with the rear of the pan and formed with fingers which slide in grooves low down in the handle, there being transverse holes at each end of the grooves. The pan is preferably formed of a single sheet of metal, the back and top being formed of a continuation of the metal of the bottom, thus making a dust pocket in the rear.

SHOE FASTENING.—Alfred J. Waggett, Brighton, England. According to this improvement a knob-headed stud is movable in a slot coinciding in direction with the line of strain, a plate pivoted in or near the line of strain having notches at different radial distances to engage with the neck of the stud, and both stud and locking plate being applied to one flap, while a rod or arm is fixed along the edge of the other flap and a button hole is made in the flap behind the rod to engage the stud.

PRICE CARD HOLDER.—John Koehler, New York City. This device comprises a clamping section with slotted head at its upper end and an integral

pintle, while a ticket-carrying section has an integral knuckle entering the slot and turning on the pintle. It is adapted for attachment to various articles, especially to cigar boxes, to indicate the name and price of cigars.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

ELEMENTARY LESSONS IN ELECTRICITY AND MAGNETISM. By Silvanus P. Thompson. New edition, revised throughout, with additions. New York and London: Macmillan & Company. 1895. Pp. xv, 628. Price \$1.40.

Professor Thompson's previous edition of this book had so wide a circulation and was so popular and useful that the present very elegant new edition, brought very well up to date, will be warmly welcomed by electrical students. In turning the pages over the appositeness of the illustrations and the way they are applied to illustrate the subject immediately appear in the most favorable light. A quantity of problems and exercises and a most excellent index close the work. It is always a comfort to find a work of this sort published in England with no reference to such a thing as a syllabus.

A BOOK OF TOOLS. Being a catalogue of tools, supplies, machinery, and similar goods used by machinists, engineers, blacksmiths, model makers, founders, moulders, draughtsmen, inventors, and amateurs, and in manufactories, mills, mines, etc. Detroit, Michigan: Charles A. Strelinger & Company, manufacturers and dealers. Pp. xviii, 520. Price 50 cents.

We cannot let this publication go without notice, because, although it is truly and distinctively a trade catalogue, it is so excellently made up and is full of such valuable information, that it fairly eclipses many works sold simply on their merits. Although a catalogue, it sets an example to many books in having an adequate index.

SCIENTIFIC AMERICAN BUILDING EDITION.

MARCH, 1895.—(No. 113.)

TABLE OF CONTENTS.

1. Elegant plate in colors showing a cottage at Mount Vernon, N. Y., three perspective elevations and floor plans. Mr. H. R. Rapelye, architect, Mount Vernon, N. Y. An attractive design.
2. "The Gables," a half timbered cottage recently completed at Glen Ridge, N. J. Perspective elevation and floor plan. Mr. Charles E. Miller, architect, New York City.
3. A cottage at Great Diamond Island, Me., recently erected for H. M. Bailey, Esq., two perspective elevations and floor plans. A unique design for an island cottage. Mr. Jno. C. Stevens, architect, Portland, Me.
4. A dwelling at Armour Villa Park, N. Y., recently erected for J. E. Kent, Esq., at a cost of \$5,200 complete, two perspective elevations and floor plans. A very picturesque design.
5. A colonial cottage at New Rochelle, N. Y., recently erected for C. W. Howland, Esq., two perspective elevations and floor plans. Mr. G. K. Thompson, architect, New York City. A unique example of a modern dwelling.
6. The residence of Charles N. Marvin, Esq., at Montclair, N. J. A design successfully treated in the Flemish style. Two perspective elevations and floor plans. Mr. A. V. Porter, architect, Brooklyn, N. Y.
7. A fine Colonial house at Elizabeth, N. J., recently completed for Henry A. Haines, Esq. Perspective elevation and floor plans. Architects, Messrs. Child & De Goll, New York City.
8. A residence at Flatbush, L. I., recently erected for C. H. Wheeler, Esq., at a cost of \$11,000 complete. Two perspective elevations and floor plans. Architect, Mr. J. G. Richardson, Flatbush, L. I. An attractive design.
9. A cottage at Plainfield, N. J., erected for Chas. H. Lyman, Esq., at a cost of \$5,000 complete. Two perspective elevations and floor plans. Architect, Mr. W. H. Clum, Plainfield, N. J. A picturesque design.
10. An elegant house at Scranton, Pa., erected at a cost of \$15,000 complete. Two perspective elevations and floor plans. Architect, Mr. E. G. W. Dietrich, New York City.
11. Engraving showing the new building of "The Bank for Savings," recently erected on 22d Street, New York City. Mr. C. L. W. Eldlitz, architect, New York City.
12. Foundation piers of the American Surety Company's building, New York City. Four illustrations, showing the most advanced methods of caisson construction for city buildings.
13. Miscellaneous contents.—An automatic gas saving governor, illustrated.—Heating a residence with open grates, illustrated.—Arranging effective interior, illustrated.

The Scientific American Building Edition is issued monthly. \$2.50 a year. Single copies, 25 cents. Forty large quarto pages, equal to about two hundred ordinary book pages; forming, practically, a large and splendid MAGAZINE OF ARCHITECTURE, richly adorned with elegant plates in colors and with fine engravings, illustrating the most interesting examples of Modern Architectural Construction and allied subjects.

The Fullness, Richness, Cheapness, and Convenience of this work have won for it the LARGEST CIRCULATION of any Architectural Publication in the world. Sold by all newsdealers. MUNN & CO., PUBLISHERS, 361 Broadway, New York.

Business and Personal.

The charge for insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue.

"U. S." metal polish. Indianapolis. Samples free.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J. For coal hoisting engines. J. S. Mundy, Newark, N. J. We buy mailable novelties. Warren & Co., 10 E. 14th St., New York.

Screw machines, milling machines, and drill presses. The Garvin Mach. Co., Laight and Canal Sts., New York.

Centrifugal Pumps. Capacity, 100 to 40,000 gals. per minute. All sizes in stock. Irvin Van Wie, Syracuse, N. Y.

Perfect Trousers Stretcher and Press, price \$1. Agents wanted. Columbia Novelty Works, P. O. Box 243, Wash., D. C.

Emerson, Smith & Co., Ltd., Beaver Falls, Pa., will send Sawyer's Hand Book on Circulars and Band Saws free to any address.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

For the original Bogardus Universal Eccentric Mill Foot and Power Presses, Drills, Shears, etc., address J. S. & G. F. Simpson, 26 to 36 Rodney St., Brooklyn, N. Y.

'The best book for electricians and beginners in electricity is "Experimental Science," by Geo. M. Hopkins. By mail, \$4; Munn & Co., publishers, 36 Broadway, N. Y.

Competent persons who desire agencies for a new popular book, of ready sale, with handsome profit, may apply to Munn & Co., Scientific American office, 361 Broadway, New York.

Send for new and complete catalogue of Scientific and other Books for sale by Munn & Co., 361 Broadway, New York. Free on application.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(6446) E. L. K. asks: 1. How would you graphically represent the potential wave in secondary of an induction coil? A. It depends on the construction of the coil, and the determination may involve quite delicate calculations. For general alternating current work we recommend and can supply Kapp's "Alternating Currents of Electricity," price \$1; Blakeslee's "Alternating Currents," price \$1.50; Tesla's "Experiments with Alternating Currents," price \$1, by mail. 2. How is the permanence of different kinds of iron measured? A. By determining the relative traction in identically shaped samples under identical conditions of magnetizing force (ampere turns). See S. P. Thompson's "Lectures on the Electro-Magnet," \$1 by mail.

(6447) A Tropical Plant Sent from Nebraska.—The fleshy leaves and peculiar bell-shaped flowers of greenish hue, with purplish shadings, sent by Mr. J. F. Schmalzried, of North Platte, Neb., is the Bryophyllum calycinum. It is a tropical plant, occurring abundantly in the West Indies and in Madagascar, Mauritius, etc. It grows in dry situations, often in clefts of the rocks, and a closely related species is found covering the stone fences in Jamaica, producing a rather pretty effect, seeing that the leaves frequently become bright yellow and purplish. The plant really belongs to the leek family, Crassulaceae, of which the common house leek furnishes a familiar example, and the fleshy leaves bud and root readily when stuck into the soil. In Mauritius the plant is said to be used as a fomentation or poultice in intestinal complaints. It is not uncommonly grown in greenhouses for the rather odd panicles or flowers.—Answered by Professor C. V. Riley.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

March 5, 1895,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Advertising device, H. E. Hawes.....	535,202
Advertising device, J. Montagner.....	535,067
Air, means for compression of, D. McGill.....	535,259
Alarm. See Burglar alarm.	
Alarm lock, C. T. Holman.....	535,288
Amalgamation, apparatus for treatment of gold ores by dry, A. F. W. Partz.....	535,017
Amalgamation, process of and apparatus for reducing ores by, N. Lehnen.....	535,064
Armature coils, apparatus for winding, H. E. Heath.....	535,105
Armature coils, forming, H. E. Heath.....	535,106
Armature winding machine, H. E. Heath.....	535,104
Axle boxes, receptacle for packing for car, H. Rogers.....	535,023
Badge, B. S. Whitehead.....	535,059
Bag. See Mail bag.	
Basin, set wash, J. H. Stevens, Jr.....	535,147
Basin, wash, J. Kelly.....	535,208
Basket cover, W. R. Van Vliet.....	535,311
Battery. See Electric battery.	
Bed, invalid, R. Long.....	535,215
Bedpan, C. Fischer.....	535,241
Beer, etc., electrolytic conduit for, Wagner & Marr.....	535,267
Belt tightener, C. B. Kysor.....	535,140
Bicycle, L. S., and C. O. Barnes.....	535,188

Bicycle attachment, N. S. Goff	535,331
Bicycle crank axle, C. E. Hadley	535,244
Bicycle front forks, crown piece for, R. Perkins	535,145
Bicycle rest, C. H. Campbell	535,140
Bicycle saddle, W. E. Brown	535,018
Bicycles, rear wheel adjustment for, F. D. Owen	535,261
Blast holes, powder charger for, J. Schlinger	535,174
Blind operator, window, A. O. Shatsick	535,176
Boiler. See Sectional boiler. Steam boiler.	
Bottle scoop, salt mouth, W. Vincent	535,125
Bottle stopper, W. B. Stevens	535,229
Box. See Oil delivery box. Letter box.	
Brake. See Car brake.	
Brick machine, E. Fernholtz	535,280
Brick press, T. Parker	535,074
Buckle clip, H. R. Bynum	535,273
Bug catcher, J. L. Dolan	535,052
Burglar alarm for glass doors, J. B. Gill	535,100
Burner. See Oil burner.	
Button, J. V. Piecher	535,079
Button, E. Turck	535,081
Button and necktie holder, combined collar, C. S. Wilson	535,040
Can. See Oil can.	
Candle, dish, A. F. Baumer	534,951
Candle, dish or other, A. F. Baumer	534,950
Car brake, railway, N. Lampman	535,211
Car coupling, B. J. Downing	535,240
Car coupling, C. L. King	535,253
Car coupling, C. A. Power (r)	11,477
Car coupling, C. Whitmore	535,151
Car fender and brake mechanism, combined, D. H. Hill	535,166
Car fender, street, B. Hall	535,165
Car lock, freight, O. E. King	535,210
Car pilot, street, J. Rhine	535,078
Car seat, street, J. Krebber	535,168
Car starter, T. J. Gray	535,200
Car wheel, T. Sheehan	535,177
Cars, automatic protecting fender for city railway, W. H. Pace	535,221
Cardboard cutter, Saltzborn & Nicolai	535,025
Carriage, S. H. Gage	535,098
Carriage, folding baby, T. H. Wilcox	535,126
Cash register, E. F. Spaulding	535,083
Cash register and indicator, W. A. Dobson	535,188
Catapult, T. H. Cullen	535,096
Centerboard, A. Stover	535,148
Centrifugal apparatus, D. Stewart	535,306
Chain securing device, J. V. Matthews	535,015
Cheese bandage machine, J. J. Angus	535,087
Chemical, producing, N. Albrecht	535,222
Chimney cowl or vent, M. J. Moran	535,117
Chimney holder, G. S. Trumbore	535,206
Chloroform, obtaining, R. Auschutz	535,270
Churn, E. P. Smith	535,146
Churn, J. H. Stewart	535,240
Cigar bunch rolling machine, J. Bunn et al	535,048
Cigar or other case, G. Kracker	535,291
Clasp. See Sash bar clasp.	
Clasp for textile goods, E. H. Boyden	535,047
Cloth scouring machine, M. H. Kohlrausch	535,012
Clutch operating device, J. B. Smith	535,204
Coach pad, N. Teas	535,180
Coal delivery box, J. Kell	535,250
Cock, cage, M. W. Sewall	535,123
Coin freed apparatus, R. T. & J. G. Glover	535,330
Collar, harness breast, Price & Watson	535,171
Column, pole, etc., metallic, J. H. Campbell	535,101
Conveyer, W. E. Brown	535,020
Cooking and heating apparatus, H. G. O'Neill	535,072
Cooking utensil, C. E. R. Marsh	535,216
Copying press, C. R. Walder	535,268
Corn husking machine, green, L. S. Campbell	535,192
Coupling. See Car coupling. Pipe coupling.	
Cutter. See Cardboard cutter. Feed cutter.	
Thread	
Cutter or trimmer for shades, etc., M. Bretherton	535,191
Cutters, device for making, S. M. Balzer	535,127
Dam, portable, P. S. Wicher	535,153
Damagetting apparatus, C. Houlgrave	535,099
Dental cabinet, Creelman & Byrne	535,135
Dental plate, H. K. Newman	535,225
Digger. See Potato digger.	
Discharge pipe for chip chucks, B. Kotz	535,167
Ditching or road making machine, F. L. Straw	535,028
Door check, W. Gillilan	534,999
Door check, L. V. Velen	535,033
Door or window sash, E. Goff	535,123
Dough rolling and moulding machine, J. Adair	535,238
Dredging machine, W. B. Pless (r)	11,476
Drum, heating, W. Hammann	535,004
Dry washer, F. E. McKinley	535,144
Drying kiln, A. Bemis	535,316
Dust collector and separator, G. A. Meador	535,070
Dye, blue-red azo, A. Weinberg	535,037
Dye, brown, A. Weinberg	535,036
Dyeing apparatus, J. G. Haslam	535,005
Eaves trough hanger, J. Herrin	535,007
Electric battery, H. Brewster	535,030
Electric cable, C. H. Radd	535,178
Electric circuits, method of and apparatus for regulating, J. M. Bradford	535,158
Electric currents, circuit interrupter for alternating, H. N. Potter	535,077
Electric heater, R. H. DeLany	535,221
Electric motor mounting, E. J. Sperry	535,304
Elevator lock, safety, J. R. Hersh	535,008
Elevator safety device, F. T. Ellithorpe	535,095
Elevators, automatic safety device for, F. T. Ellithorpe	535,096
Engine. See Steam engine.	
Engine for moving yarns in vats, Lorimer & Birkey	535,142
Engine indicator, steam, M. J. Wayne	535,152
Envelope, H. R. Denis	535,275
Exercising device, finger, F. E. Osterhout	535,230
Extension table, F. K. Ketchum	535,028
Extension table, round, N. Lattard	535,212
Feathers, machine for weighing and quilting, A. E. Flattick	535,242
Feed box, gravity, G. G. Powell	535,020
Feed cutter and corn husker, combined, A. Rosent	535,024
Fence set, wire, I. K. Hollinger	535,110
Fence, wire, S. E. Jackson	535,051
Fence wire fastener, S. F. Douglass	535,238
Fender. See Car fender. Safety fender.	
Fertilizer distributor, G. D. Haworth	535,006
Fibrous material, apparatus for breaking and bleaching, Cawthorn & Cornett	535,237
Fifth wheel, C. R. Turner	535,232
Filter, T. D. Pessley	535,295
Filter, J. G. & S. A. Sutton	535,308
Fire door, steam operated, D. Holway	535,138
Flagstaff ornament or weather vane, preservative, Anderson & Gibbons	535,044
Floorcloth, machine for the manufacture of, H. W. Godfrey et al	535,101
Fly frame, C. Whitaker	535,038
Food, fibering or shredding machine, Shute & Andron	535,263
Fruit picker, W. T. S. Dickey	534,997
Fruit pitter, Hall & Chase	535,333
Furnace. See Garbage furnace. Pit furnace.	
Furnace, J. W. Holaday	535,137
Furnace roof or top, C. Martin	535,114
Furniture, knock-down, W. Schwartz	535,081
Furniture, measuring and regulating device for adjustable school, F. W. Hill	535,287
Gage. See Pressure gage.	
Gage for indicating thickness of paper, etc., L. Schopper	535,224
Game apparatus, C. M. Conn	535,194
Garbage furnace, D. Lance	535,292
Gas regulator and meter, M. Spitzer	535,305
Gate, A. W. Kuncie	535,251
Generator. See Steam generator.	
Glass and making same, wired, E. Walsh, Jr.	535,035
Gleazier's tool, G. A. Rogers	535,222
Grate, dumping, B. E. Weeks	535,233
Gutter and cornice plate for horticultural buildings, combined, W. A. Burnham	535,091
Hammock, J. Brayshaw	535,131
Hammock, R. C. Funke	534,998
Hanger for support of ceiling, Dorman & Zocher	535,277
Harness, Albert, Wilson	535,234
Harrow, disk, W. H. Parlin	535,075
Harvester, W. D. Markley	535,189
Harvester and husker, corn, A. Steiner	535,228
Harvester elevator, M. Kane	535,249
Hat secure, H. C. Smith	534,989
Hay sling, S. M. Jenks	535,248
Heater. See Electric heater. Water heater.	
Heater for use in manufacture of artificial fuel, H. S. Albrecht	535,182
Hitching device, F. Cole	535,819
Hitching strap, H. Valdeau	535,032
Hoisting and conveying device for tramways, McDowell & Cooney	535,219
Horse starter, T. F. Logan	535,141
Hub, metal, J. M. Kroener	535,013
Hydrant, J. C. Kupferle	535,063
Hydraulic press, O. W. Ketchum	535,112
Indicator. See Engine indicator.	
Injector attachment, N. Dodd	535,339
Insulating conduit for electric conductors, Stillwell & Scott	535,084
Jack. See Lifting jack.	
Kiln. See Drying kiln.	
Knitting machine, thickening thread mechanism, A. Sedlmayr	535,226

Knob, S. P. Cooley	535,050
Knob attachment, J. J. Bailey	535,196
Ladder, fireman's, D. Snell	535,192
Lamp, W. M. Harrison	535,135
Lamp, electric, W. P. Davis	535,051
Lamp, incandescent electric, F. L. Fowler	535,199
Lamp support and cut-out, electric, L. Johnson	535,336
Last, G. E. Belcher	535,315
Letter box, E. S. Butler	535,311
Lid for tea kettles, etc., J. P. Leggett	535,252
Life-preserver and magazine, combined, E. Bennett	535,045
Life-saving cap, A. Mendelson	535,143
Lifting jack, W. B. Boyd	535,089
Light fixture or analogous article, McElroy & Bayley	535,069
Lighting arrester, A. Wurts	535,066
Link, spring, H. Barber	535,156
Links, die for manufacture of, J. Smith	535,301
Linoleum, apparatus for and method of manufacturing, D. N. Melvin	535,217
Lock. See Alarm lock. Car lock. Elevator lock.	
Lock, J. S. Barney	535,128
Locomotive stand pipe, O. H. Arner	534,988
Loom picker, J. & A. Muir	535,118
Loom shuttle guard and catcher, C. H. Wilkinson	535,083
Lubricator, W. P. Cronin	535,136
Mail bag, W. R. Gordon	535,001
Mail bag catcher and deliverer, C. F. Silger	535,300
Mangle, A. R. Gustafson	535,133
Mangle, steam, C. Striewling	535,265
Match making machine, L. H. Wolfe	535,041
Match scratcher and deliverer, automatic, Hauptmann & Schwarz	535,201
Measuring and drawing instrument, W. S. Rowell	535,223
Measuring instrument, distance, J. L. Buford	534,993
Metal plate edges, machine for trimming, J. R. Sanford	535,121
Metal shaping machine for cutting, H. C. Jones	535,207
Milling machine, G. W. Hadley	535,245
Mitten, catcher's, A. Slomka	535,178
Mortar mixing machine, A. Oehler	535,170
Motor. See Pendulum motor.	
Mower, lawn, E. D. Robbins	535,022
Muscle testing machine, C. A. Day	535,053
Oil burner, R. Goodman	535,000
Oil can, E. R. Deverall	535,197
Oils, process of and apparatus for gasifying hydrocarbon, E. Tatham	535,310
Oyster bed, D. H. Hibbert	535,136
Pad. See Coach pad.	
Paper casing, J. D. Moritz	535,258
Paper holder, J. T. Hoyt	535,335
Paper pulp, engine for preparing, P. Huber	535,205
Paper winding machine, W. R. Farasworth	535,326
Pen, fountain, L. Golwer	535,283
Pen, marking or shading, M. B. Moore	535,267
Pendulum motor, J. Gambetta	535,329
Phosphates, making citrate soluble, A. R. O. Pieper	535,077
Phosphates, making tetrabasic, Howe & Stead	535,204
Piano, G. P. Bent et al	535,180
Planing machine, G. H. Arthur	535,180
Pill box, M. M. Dessau	535,054
Pipe. See Discharge pipe.	
Pipe coupling, J. Anderson	535,236
Pipe hanger, H. F. Edwards	535,094
Pit furnace, C. A. Trautwein	535,094
Polariscope, H. Morrell	535,218
Potato digger, J. H. Hilt	535,109
Potato digger, Roberts & Donovan	535,080
Powder, distributor, C. H. Leggett	535,113
Press. See Hydraulic press. Printing press.	
Press for pressing composite building mats, fasteners, etc., C. B. Bosworth	535,071
Pressure gage, recording, C. B. Bosworth	535,157
Printing press, Gerkey & Mayerhoff	535,282
Propeller blade, T. Armstrong	535,271
Propeller, screw, C. R. Purnell	535,172
Pulley, expandable, C. Von Riesen	535,084
Puller, wood, J. L. Foster	535,340
Pulverizing mills, automatic feed for, W. B. McPherson	535,260
Pump, J. O'Neill	535,073
Pump operating mechanism, M. Leitch	535,233
Puzzle, S. J. Eyman	535,279
Railway conduit, electric, W. T. Bulany, Jr.	535,324
Railway head, Brady, Jr. & Spence	534,992
Railway rails from spreading, device to prevent, C. Keeler	535,290
Railway signal, W. P. Hall	535,102
Railway switch, Dilworth & Lipsey	535,164
Railway switch, Baldwin & Sweet	535,106
Railway train signal, A. H. H. Guiley	535,332
Railways, closed conduit for electric, P. Murphy	535,294
Railways, contact device for conduit electric, F. E. Lodetti	535,214
Railways, sectional conductor system for electric, R. Renbald	535,297
Receiving and breaking table, A. R. Ferriday	535,281
Refrigerator car, H. A. Bowen	535,046
Register. See Cash register.	
Revolver safety device, F. B. Felton	535,097
Rheostat, A. J. Shaw	535,337
Rope fastener, J. C. Warren	535,337
Rotary engine, J. West	535,337
Roundabout, F. S. Baldwin	535,272
Safe jacket, money, Bernardin & Munson	535,129
Safety fender, Amick & Roos	535,184
Sand washing machine, J. C. H. H. H. H.	535,010
Sash bar clasp, W. A. Burnham	535,049
Sash fastener, J. J. Aldorf	535,325
Saw guide, W. N. Elliott	535,043
Seal and tag, car, F. Aldrich	535,028
Seal lock, Sebring & Edgar	535,028
Seal, rubber, J. C. Taylor	535,157
Sectional boiler, Baker	535,157
Seines, hauling, R. D. Hume	535,246
Sewer flusher, automatic, P. B. Donahoe	535,322
Sewing machine feeding mechanism, V. Witte	535,181
Sharpener or cutter, disk, L. B. Lancaster	535,014
Shutter fastener, J. J. Ellis	535,056
Signal. See Railway signal. Railway train signal.	
Sleigh, D. S. Hall	535,008
Spark arrester, T. H. Schroder	535,262
Spectrum, Seybold & Stites	535,298
Spindle, machine, J. C. H. H. H.	535,318
Spindle bearing adjusting device, W. A. Chandler	535,318
Spinning and twisting machine separator, G. O. & G. A. Draper	535,323
Spinning machine tension mechanism, ring, M. E. Sullivan	535,029
Spraying machine, J. C. H. H.	535,029
Stacking apparatus, N. Housinger	535,099
Steam boiler, M. R. Moore	535,115
Steam generator, A. G. Mumford	535,068
Stone, artificial, H. Gallinowsky	535,327
Stopper. See Bottle stopper.	
Strap. See Belt.	
Straw stacker, F. W. Robinson	535,296
Sucker rod coupling, W. H. Downing	535,278
Switch. See Railway switch.	
Table, C. S. Van Nuis	535,149
Table. See Extension table. Receiving and breaking table.	
Tablet, manufacturing photographic, W. Assheton	535,313
Tap, antifriction adjustable, W. R. Clark	535,274
Tea kettle, Clinton & Bowker	535,098
Telephone and telephone system, combined, C. A. Shea	535,299
Telephone apparatus, O. L. Wullweber	535,042
Telephone transmitter, J. H. M. Goodman	535,294
Telephone transmitter, battery, W. W. Jacques	535,247
Telephone, W. W. Jacques	535,289
Tent, I. Mautner	535,095
Testing machine, C. E. Buzby	534,994
Thill coupling, W. L. Frantz	534,995
Thill coupling, W. L. Frantz	535,056
Thread cutter and thimble, combined, M. R. Gray	535,285
Tile, roofing, T. A. Aldridge	535,183
Timepiece hands, tool for removing, Carr & Fanning	535,092
Tire for cycles, pneumatic, J. W. Hall	535,069
Tire, pneumatic, L. S. & C. O. Barnes	535,189
Tire, pneumatic, R. W. Huss	535,206
Tobacco granulating machine, Happich & Youmans	535,134
Tobacco, method of and apparatus for ordering, C. W. Schwartz, Jr.	535,175
Tool holder and rest therefor, E. Rivett	535,021
Toy cannon, S. Sparling	535,124
Trace carrier, M. A. Martin	535,255
Track cleaner, A. J. Smith	535,302
Transformer, F. S. Huntington	535,010
Trousers suspender attachment, T. S. Slaughter	535,227
Truck, motor, E. A. Sperry	535,303
Turnbuckle, Bartlett & Hancock	535,314
Tyure, force, P. J. Fitzsimmons	535,057
Type distributing machine carrier, L. K. Johnson	535,111
Typewriter cabinet, W. Horrocks	535,179
Typewriter machine attachment, C. Spiro	535,016
Valve, automatic air, Paige & Allen	535,159
Valve, balanced slide, D. H. Brown	535,002
Vehicle top, folding, A. Haberling	535,002
Velociped driving mechanism, J. Marty	535,256
Velociped pedal, C. H. W. Leach	535,162
Veneer jointer and shaper, wood, G. H. Carlson	535,276
Ventilator, H. Doerge	535,070
Vessel, metallic, McLaughlin & Martin	535,312
Violin, J. Vivier	535,019
Washer. See Dry washer.	
Washer, Pipher & Strickfellow	535,019
Watch center wheel and pinion, F. H. Corbell	535,238

Water closet bowl, J. Kelly	535,139
Water closet flushing rim, W. A. Kelly	535,032
Water closet valve, J. H. Williams	535,338
Water distribution, W. T. Boyd	535,130
Water heater and purifier, H. B. Gates	535,243
Weeding implement, Davis & Selpie	535,163
Well packer, anchor, I. N. Hoadley	535,334
Wheel. See Car wheel. Fifth wheel.	
Winding or tapping machine, H. E. Heath	535,107
Windmill, J. A. Chapman	535,193
Windmill, P. A. Norberg	535,120
Wire stretcher and tightener, B. A. Stockin	535,307
Wrist plate hook rod, H. A. Hewitt	535,286

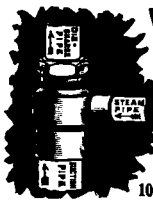
DESIGNS.

Cabinet, E. P. Carolan	24,079
Cake cutter, T. L. Green	24,077
Chair bracket, rocking, W. I. Bunker	24,080
Form, coat, E. W. Buehl	24,076
Leg support, W. S. Sargent	24,086
Musical stand, J. Mueller	24,078
Roofing plate, W. H. Mullins	24,082
Scale beam support, W. H. Sargent	24,087
Stair button, H. Renbel	24,081
Tile, roofing, W. H. Mullins	24,083 to 24,085

TRADE MARKS.

Agricultural machines, tools, and implements, including planters, distributors, mowers, reapers, and harrows, Texas Implement and Machine Company.....	26,178
Bottled goods, canned fruits, olive oil, prunes, capers, and other relishes, American Grocery Company.....	26,180
Canned salmon, Alaska Packers' Association.....	26,181
Cards, playing, New York Consolidated Card Company.....	26,148
Cement, Portland, Offenbacher Portland Cementfabrik Actiengesellschaft.....	26,187
Cigarettes, National Cigarette and Tobacco Company.....	26,149
Colored waters, Von Mueller & Company.....	26,188
Confectionery, certain named, Hess Brothers.....	26,150
Cotton goods, piece, Bister & Schmitt.....	26,190
Flour, wheat, Bozeman Milling Company.....	26,186
Flour, wheat, New Athens Milling Company.....	26,184
Gelatine, baking powder, and flavoring extracts, P. W. Thayer.....	26,151
Glass, sheet, Mississippi Glass Company.....	26,163
Gloves, Kitz.....	26,146
Gloves, Perrin Freres & Cie.....	26,189
Hair restoratives, A. Nattans.....	26,153
Hams, bacon, smoked meats, lard, and oils, N. Morris & Company.....	26,183
Hardware, J. H. Felt's Electrical, F. Moll & Son.....	26,177
Lubricating paste, Du'Rey Sociality Company.....	26,157
Photographic and chemical products, Chemische Fabrik auf Actien, vormals E. Schering.....	26,155
Pork and beans, aked, Van Camp Packing Company.....	26,182
Pottery for household use, Jones, McDuffee & Stratton.....	26,162
Pottery for table use, Jones, McDuffee & Stratton.....	26,161
Powder for preventing foot, R. Givens.....	26,156
Remedy for erysipelas and eczema, liquid medicinal, Nyassan Medicine Company.....	26,152
Silks, satins, and ribbons, E. S. Jaffray & Company.....	26,187
Stoves, gas heating, F. Siemens.....	26,176
Stoves, gas heating, F. Siemens.....	26,179
Suppositories, Hall & Ruckel.....	26,164
Tin plates, terne plates, and similar goods, American Tin Plate Company.....	26,173
Valves and pipe fittings, Eastwood Wire Manufacturing Company.....	26,175
Yellow pine, J. H. Felt & Company.....	26,177
Wool goods, including shawls, aprons, borse clothing, and saddlers' goods, J. J. & W. Wilson.....	26,191

Founded by Mathew Carey, 1785.
HENRY CAREY BAIRD & CO.
 INDUSTRIAL PUBLISHERS, BOOKSELLERS & IMPORTERS
 810 Walnut St., Philadelphia, Pa., U. S. A.
 Our New and Revised Catalogue of Practical and Scientific Books, 90 pages, 8vo, and our other Catalogues and Circulars, the whole covering every branch of Science applied to the Arts, sent free and free of postage to any one in any part of the world who will furnish his address.



VANDUZEN STEAM PUMP
 THE BEST IN THE WORLD.
 Pumps Any Kind of Liquid.
 Always in Order, never Ologs nor
 freezes. Every Pump Guaranteed.
 10 SIZES.
 200 to 12000 Gallons per Hour.
 Cost \$7 to \$75 each. Address
THE E. W. VANDUZEN CO.,
 102 to 108 E. Second St., Cincinnati, O.

CARBORUNDUM
 HARDEST ABRASIVE KNOWN. EMERY AND
 DIAMOND POWDER, SUBSTITUTES, IN FLOUR,
 POWDER, CRYSTAL, WHEEL, SLAB & HONE FORM.
 CARBORUNDUM CO., MONROGHELA CITY, PA., U. S. A.

Parson's Horological Institute.
School for Watchmakers
 ENGRAVERS AND JEWELERS.
 Send for Catalogue and References.

PARSON'S HOROLOGICAL INSTITUTE,
 302 Bradley Avenue, PEORIA, ILL.

ITS JET BLACK-S & H. WATERPROOF INDIA INK
 FREE FLOWING & ABSOLUTELY WATERPROOF
 THE BEST LIQUID DRAWING INK NOW MADE
 If your dealer does not keep this ink in stock
 send 25 cents in stamps to **THEO. ALTE-
 NBER & SONS, Philadelphia**, and they
 will send you a full size bottle.

Telephones
 Sold outright. Cannot get out of order.
 Guaranteed free from infringement.
 Suitable for exchanges or private plants.
 Send for Testimonials and Prices.
 Some good territory left for reliable agents.
MASON TELEPHONE CO., RICHMOND, VA.

Split Die & Tap Holders for holding
 Machine
 Screw
 Taps
 and Dies
 used in
 Bicycle
 Plates.
 Four assortments for
 each holder, holding up
 to and including 14 sizes.
 Send for fully illus-
 trated catalogue.
WELLS BROS. & CO., P. O. Box B, Greenfield, Mass.

WATER MOTOR CASTINGS
 1/16 Horse Power.
A. F. WEED & CO.
 106-8 Liberty St., New York.
 See illustrated notice, page 155,
 Sci. Am., March 9, 1895
 Gas Engine Castings, Boilers,
 Engines, Dynamos, etc., etc.

AMERICAN GAS FURNACE CO.
 OF ELIZABETH, N. J., PATENTERS OF
 A Complete System for the generation of a
 CHEAP AND PERFECT FUEL GAS.
GAS BLAST FURNACES,
 for all kinds of Mechanical Work,
HIGH PRESSURE BLOWERS, ETC.
 Illustrated Catalogues on application.
 Address, 80 NASSAU STREET, NEW YORK.



The United
Autographic Register Co.,
 148-154 Monroe St. Chicago
 REGISTERS LEASED at a
 cost
 of less than 2 cents per day.
 OR SOLD at from \$15 to \$50.
 52000 in use. Made
 in 25 styles. Send for Circulars
 BEWARE OF INFRINGEMENTS.



FREE IT COSTS YOU NOTHING
 THIS HIGH-GRADE \$60.00 MACHINE
 ABSOLUTELY FREE. No Misrepresentation.
 No Scheme. We mean just what we say
 This machine is yours free. No such opportunity has
 ever before been offered. We shall continue these lib-
 eral terms for only a short time. Cut this out and
 write to-day. Sewing Machine Department, T. 897
OXFORD BROS. CO., 842 Wabash Ave., Chicago

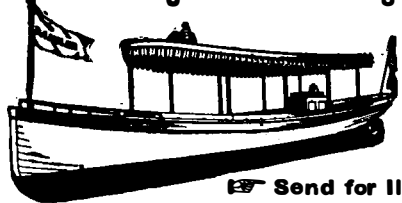
MALLEABLE AND FINE GRAY IRON ALSO STEEL
 CASTINGS FROM SPECIAL
 THOMAS DEVLIN & CO. FINE FINISHING PATTERNS
 12 HIGH AVE. & AMERICAN ST. PHILA.

The Scientific American
 PUBLICATIONS FOR 1895.

The prices of the different publications in the United States, Canada, and Mexico are as follows:

RATES BY MAIL.	
The Scientific American (weekly), one year	\$3.00
The Scientific American Supplement (weekly), one year	5.00
The Scientific American, Export Edition in which is incorporated the Spanish Edition (monthly), one year	3.00
The Scientific American Architects and Builders Edition (monthly), one year	2.50
COMBINED RATES.	
The Scientific American and Supplement	\$7.00
The Scientific American and Architects and Builders Edition	5.00
The Scientific American, Supplement, and Architects and Builders Edition	9.00
Proportionate Rates for Six Months.	
This includes postage, which we pay. Remit by postal or express money order, or draft to order of	
MUNN & CO., 361 Broadway, New York.	

DAIMLER MOTOR COMPANY,
 BUILDERS OF
Highest Grade Single and Twin Screw Launches.



Safest, cleanest and speediest power boat built.
 No smoke or smokestack, no boiler, no elec-
 tricity. No steam or naphtha under pressure.
 Run on one pint of gasoline per horse power
 per hour, and are under way in less than one
 minute. No licensed engineer or pilot.
 Also Stationary Motors.

Send for Illustrated Catalogue and Price List.
OFFICE AND WORKS, "STEINWAY," LONG ISLAND CITY, N. Y.

**IMPROVED COMBINATION
 DIVIDER AND CALIPER.**
 Can be used as a Divider, a Hermaphrodite,
 Keyhole, Inside and Outside Caliper.
 By mail, postpaid,
 4 inch.....\$2.00 | 8 inch.....\$2.50
 6 ".....2.25 | 10 ".....2.75
 Mechanics' Fine Tools of all kinds.
 Send for Illustrated Catalogue B.
Standard Tool Co., - Athol, Mass.

Experimental & Model Work
 E. V. BAILLARD, 106 Liberty Street, N. Y.

Reece's Pat. Hand Bolt Cutter or Screw Plate
 Send for new Catal. of
 Edw. J. Reece, Manuf.,
 Screw Cutting Tools,
 Greenfield, Mass.

Starrett's Universal Surface Gauge
 This gauge has joint at
 base allowing spindle
 and scriber to be moved
 back and forth and
 placed in any position
 from upright to horizon-
 tal, to reach over, back
 of, and underneath.
 Price, No. 1, 9 inch.....\$2.50. No. 2, 12 inch.....\$3.00
 No. 3, with two spindles, 12 and 18 inches.....3.50
 Illustrated Catalogue Free.
The L. S. Starrett Co., P. O. Box 15, ATHOL, MASS.

\$24. An 8 Light, 16 C. P., 110 Volt Dynamo
 To introduce our Dynamos
 and Motors of larger capacity
 and gain the confidence of
 the public, we place on the
 market a high grade machine
 retaining all the special fea-
 tures of larger machines.
 Durable, efficient, compound
 wound, self-oiling, finely
 finished. Plating Dynamos.
 all sizes.
 Send for circular No. 22
ROTH & ECK,
 32 Market St., Chicago, Ill.

ROCK EMERY
 Hundreds in Use
 for All Purposes.
 Send for Circular.
Sturtevant Mill Co., Boston, Mass.

CRITERION MAGIC LANTERNS And
 Stereopticons.
 Oil, Lime or Electric Light. Front of Lanterns easily removable for substitution
 of scientific attachments. We make lanterns and views for all kinds of uses.
 Catalogues free. **J. B. COIT & CO., 16 Beekman St., New York.**
 189 La Salle St., Chicago. 50 Bromfield St., Boston. 181 Post St., San Francisco.

PATENTS
 MESSRS. MUNN & Co., Solicitors
 of Patents, have had nearly fifty
 years' continuous experience. Any
 one may quickly ascertain, free,
 whether an invention probably is
 patentable by writing to Munn & Co.
 Communications strictly confidential.
 A handbook of patents and
 how to obtain them sent free.
 taken through Munn & Co. receive
 special notice in the Scientific
 American. This splendid weekly paper,
 elegantly illustrated, has the largest
 circulation of any scientific work.
 \$3 a year. Specimen copies free.
 Address **MUNN & CO.,**
 New York, 361 Broadway.

HIGH GRADE ONLY. Warranted. Contractors
 desiring a trustworthy Jack Screw, ad-
 dress **RUMSEY & CO., Ltd., Seneca Falls, N. Y.**

FOOT POWER MACHINERY
 Scroll Saws, Tools, Drills, Forges, etc. Send to for
 catalogue. **Wilkinson Co., 86 Randolph St., Chicago.**

THE ELECTRIC LAUNCH CO.
 OFFICE AND WORKS.
MORRIS HEIGHTS, NEW YORK CITY

MONITOR VAPOR ENGINE AND
POWER COMPANY,
 8 ERIE STREET, GRAND RAPIDS, MICHIGAN.
 GASOLINE LAUNCH ENGINES AND LAUNCHES

THE "MUNSON" TYPEWRITER
 This machine is an "evolution," the outgrowth of years of experience and the
 best results of scientific work. Its principles appeal at once to the
 educated mechanic. It is Light, Small, Compact,
 Easily operated, with Universal Key Board.
INTERCHANGEABLE STEEL TYPE WHEEL,
 durable and easily kept in order. 30 keys, 90 characters. Weight, with carry-
 ing case, 16 pounds. Special wheels for different languages.
 Highest Medal Awarded, World's Fair, Chicago, 1893. Send for circular to
The Munson Typewriter Co., 171 E. Division Street, Chicago, Ill., U. S. A.

"WOLVERINE"
GAS & GASOLINE ENGINES
 STATIONARY AND MARINE.
 The "Wolverine" is the only revers-
 ible marine gas engine on the market.
 It is the lightest engine for its power.
 Requires no licensed engineer. Ab-
 solutely safe. Manufactured by
WOLVERINE MOTOR WORKS,
 12 Huron St., Grand Rapids, Mich.

How To Make a Dynamo
 OR MOTOR. 1/4 horse power size, illustrated with
 full working drawings. By E. J. Trevor. Price 10c.
Babier Publishing Co., Lynn, Mass.

NATIONAL TYPEWRITER
 IRRESPECTIVE OF PRICE
 THE BEST TRIAL PROVES IT.
 Surpasses in many features, and
 equals in all points, any Type-
 writer made and sold in the
 world at any price. Catalog E and
 Specimen of Color Work FREE.
NATIONAL TYPEWRITER CO.,
 22d & Arch Sts. Phila. Pa. U. S. A.

MATCH * MACHINERY.
 Latest improved. Complete plants furnished. **JOS. C.**
DONNELLY, 1209 Buttonwood Street, Philadelphia, Pa.

PUMPS FOR COMPRESSING
OXYGEN & HYDROGEN
GASES INTO CYLINDERS
 BY HAND POWER. PRICE \$15.00
 SEND FOR CATALOGUE NO. 2 TO
CHAS. BESELER,
 218 CENTRE ST. NEW YORK.

Made of Large Blocks of Emery Set in Metal.
 Fastest Grinders known. Can grind anything
 NO PICKING.
 Made Sharp. Stay Sharp
 Will Fit any Mill Frame.
 Cheap as Best French Buhrs.
MILLSTONES.

CLAY, TORBENSEN, GLOUCESTER CITY, N. J.
 DESIGNERS & BUILDERS OF YACHTS,
 LAUNCHES AND HOUSE BOATS.
 SEND 8 CENTS FOR CATALOGUE

WELL DRESSED, MEN
 wear only merchant tailor made clothes.
**A Tailor-Made
 Suit For
 \$10.00**
 We'll make to your measure a Frock
 or Sack Suit of
ALL WOOL GOODS
 equal to any tailors \$18.00 garment for
 \$10.00. Other Suits and Trousers just
 as cheap. We save 50 per cent by
 buying big lots of wools direct from
 the mills—that accounts for it.
 All goods sent C. O. D. with privilege
 of examination before paying express
 agent. We pay express charges.
 Send for samples of cloth and full
 particulars, free.
LOUIS X. VEHON, Tailor, 323 Dearborn St., Chicago.

SYLPH CYCLES RUN EASY
 Handsomest, highest grade,
 fastest, 16 to 22 lbs. **Highest**
Award World's Fair.
 Overland Cycles, all
 sizes, \$40 to \$75. Others \$15
 up. Cata. free. Estab. 1864.
House, Hazard & Co.,
 Mfrs., 16 6th St., Peoria, Ill.

FIRE is automatically started in stove while in bed by
 pressing the button. A household convenience.
 Price, complete with stand, battery, wire, etc., \$3.25.
 Agents wanted. Address **P. A. Newman, Runge, Texas**

SEND FOR CIRCULAR.

GATES ROCK AND ORE BREAKERS
 OVER 1000
 IN USE
 THROUGHOUT
 THE WORLD
 GREATER CAPACITY USING LESS
 POWER THAN ANY OTHER ON EARTH
 MODERN
 MINING MACHINERY
 OF EVERY DESCRIPTION
GATES IRON WORKS DEPT. T
 50 S. CLINTON ST. CHICAGO.

ICE MACHINES. Corliss Engines, Br. "era"
 and Bottlers' Machinery. **THE V. V. NEW**
MFG. CO., 889 Clinton Street, Milwaukee, Wis.

INCUBATORS
 Self-Regulating Brooders.
 Most Perfect Machines, Best
 Material and Workmanship.
 Our Thermo Regulator
 is so accurate that thermom-
 eter can be dispensed with.
 15 breeds high-class poultry.
 Full stock poultry supplies.
 Send to for large illust'd catalogue. Peerless Incu-
 bator & Brooder Co., 515 Ohio Street, QUINCY, ILL.

TURBINE WATER WHEELS.
 Send for Pamphlet.
JAMES LEFFEL & CO.,
 Springfield, Ohio, U. S. A.

MONITOR INCUBATOR
 Self Regulating. Large Illustrated 64
 page catalogue for 4 cents in stamps.
MONITOR INCUBATOR CO.,
 61 RACE STREET, BRISTOL, CONN.

EXPERT MODEL MAKING. Established
 1867.
J. C. SEYI, Prop. Chicago Model Works, Chicago, Ill. 179
 E. Madison St. Write for Catalogue of Model Supplies

USE GRINDSTONES?
 If so, we can supply you. All sizes
 mounted and unmounted, always
 kept in stock. Remember, we make a
 specialty of selecting stones for all spe-
 cial purposes. Ask for catalogue.
THE CLEVELAND STONE CO.,
 2d Floor, Wilshire, Cleveland, O.

\$5 HAND BONE, SHELL AND
CORN MILLS for Poultrymen.
 Circular and testimonials free.
WILSON BROS., Easton, Pa.

TYPE WHEELS, MODELS & EXPERIMENTAL WORK. SMALL SHOWY
 NOVELTIES & ETC. NEW YORK STENCIL WORKS 100 NASSAU ST. N. Y.

CONSULTATION INVENTORS.
 AND ADVICE TO
 Experimental work of every description. Automatic
 machinery designed and built. Send for circular.
MALBY MFG. CO., Brooklyn, N. Y.

HELLO!
 Our New 50c. Telephone
 Entirely new and original. The receivers
 of this outfit are so constructed that they
 have extraordinary acoustic properties. A
 whisper may be plainly heard at 500 ft. No battery
 required. Receivers are imitation hard rubber, the
 same in form as used on regular instruments. For
 inside and all short line this is better than a \$100
 outfit. Complete for both ends with all accessories and instructions
 for using. Sent by express on receipt of 50c. or by mail for 8c. extra.
R. H. INGERSOLL & BRO. 65 GORTLAND ST. N. Y. CITY.

TELESCOPES
 CATALOGUE
W. & D. MOGEY,
 BAYONNE CITY, N. J.

CONTRACTS WANTED.
 To manufacture Hardware Specialties, Pat'd Novelties
 and Sheet Metal Stamping. **Larg Mfg. Co., Racine, Wis.**

BOYS! HAVE YOU A PRINTING PRESS?
 You can make \$10 weekly printing cards.
 Press, Ink, Type, \$1.25 and \$2. Self Inking
 Press, \$3. Larger presses, \$10, \$15, \$25. Cards
 at wholesale. Sample pack with cards and
 cat. with directions how to become a printer
 for 3c. stamps. **W. C. Evans, 52 N. 9th St.,**
Philadelphia, Pa.

WOODEN TANKS.
 For Railroads, Mills and Manufactories.
 Builders of Steel Tanks and Tanks.
 La. Red Cypress Wood Tanks a specialty.
W. E. CALDWELL, CO.,
 217 E. Main Street, Louisville, Ky.

SANITARY SOAP VASE
 PREVENTS disease, waste, pilfer-
 ing of soap, clogging of waste pipes,
 stain of marble, uncleanly soap dish.
 AFFORDS each user fresh, dry
 pure soap.
 The Only Clean, Sanitary, and Safe
 way to use soap.
 Agents Wanted.
Sanitary Soap Vase Co.,
 Aqueduct Bldg., ROCHESTER, N. Y.

FASTER THAN SHORTHAND!
 Anderson's Shorthand
 Typewriter prints a word
 at one stroke! Price, \$25.
 It is a perfect substitute
 for stenography, and has
 already taken its place in
 many of the largest en-
 tablishments in the coun-
 try. You can learn at
 home without a teacher; no knowledge of shorthand
 necessary. Begin practice NOW and you will be ready
 for WORK next month. **S. G. K. Anderson, 50 Chestnut**
St., Newark, N. J. New York Office, 291 Broadway.

Box of 50 Cigars
 AND AN
18k GOLD FINISHED
 Watch, Chain and Case.
 Cut This Advertisement
 Out and send it to us with
 your name and address
 and we will send to you
 by express for examination
 this genuine 18k gold
 plated watch (equal in ap-
 pearance to solid gold)
 and a box of 50 of our fine
 cigars. You examine
 them at the express office
 and if satisfactory pay
 the agent \$2.98 and they
 are yours. This is a special
 offer to introduce our
 cigars, and only one watch
 and one box of cigars will
 be sent to each person or-
 dering at this price. The
 watch is a beauty and
 would cost you in a retail
 store twice as much as we
 offer the cigars and watch
 together for. Mention in your letter
 whether you want cigars or ladies'
 size watch and write to-day as this will not appear again. Address
THE NATIONAL MFG. & IMPORTING CO.,
 334 Dearborn Street, Chicago, Ill.

Advertisements.

ORDINARY RATES.

Inside Page, each insertion, - 75 cents a line
Back Page, each insertion, - \$1.00 a line
For some classes of Advertisements, Special and
Higher rates are required.

The above are charges per agate line—about eight
words per line. This notice shows the width of the line,
and is set in agate type. Engravings may head adver-
tisements at the same rate per agate line, by measure-
ment, as the letter press. Advertisements must be
received at Publication Office as early as Thursday
morning to appear in the following week's issue.



Mistakes in Addition,
Office Headache,
and mistakes in carrying forward
don't occur where the Compto-
meter is used. It saves half the
time in doing the work and all
time looking for errors. Solves
with great rapidity and absolute
accuracy all arithmetical prob-
lems. Why don't you get one?
Write for Pamphlet.
FELT & TARRANT MFG CO.
52-55 ILLINOIS ST., CHICAGO.

KEUFFEL & ESSER CO. 129 Fulton and N. Y.
BRANCHES:
111 Madison St., Chicago. 708 Locust St., St. Louis.

Drawing Materials

Esser's Patent Pivot Joint Compasses, the acme of
perfection, superior to all other pivot joints. Handsome
twelve page pamphlet "How to Select Drawing Instru-
ments," sent free on application.

Chicago, Ill. and Stave Mill Machinery
and Veneer Cutting.
Send for Cat. A.



Handle Machinery
for Turning Handles
for Brooms, Axes,
etc. Send for Cat. B.
Wood Pulp Ma-
chinery. Send for
Cat. C.
Trevor Mfg. Co.
Lockport, N. Y.

American \$6 Typewriter

A standard made machine, capable of good, hard
service. Three thousand sold the past year.
Writes capitals and small letters (11) characters.
Has a cast iron base and top plate, steel working
parts, handsomely nickel-plated and enameled; in fact,
the highest standard is maintained in its manu-
facture. Write for Illustrated Catalogue.

American Typewriter Co., 267 Broadway, N. Y.

THE "CLIMAX"

Stereotyper and Moulding Press

combined, for making perfect Cellu-
loid Stereotypes to be used in
place of metal stereotypes. Also for
making Rubber Stamps. Should
be in use in every printing office.
See Sci. Am., Dec. 30, 1893. Send for
circular to

THE J. F. W. DORMAN CO.
217 E. German St.,
Baltimore, Md.
Manufacturers of
Rubber Stamps, Vulcanizers, Stereo-
type Machinery and Supplies.

Scientific Book Catalogue

RECENTLY PUBLISHED.

Our New Catalogue containing over 100 pages, includ-
ing works on more than fifty different subjects. Will
be mailed free to any address on application.

MUNN & CO., Publishers SCIENTIFIC AMERICAN,
361 Broadway, New York.

\$18 buys a beautiful little Canoe; or
a magnificent Pleasure Boat for
two. Send for descriptive illus. catalog.
J. H. RUSHTON, CANTON, N. Y.

ADJUSTABLE HOLDERS
FOR
INCANDESCENT LAMPS.
O. C. WHITE CO. WORCESTER, MASS.
SEND FOR CIRCULARS.

The American Bell Telephone Company,

125 Milk Street,
Boston, Mass.

This Company owns Letters-
Patent No. 463,569, granted
to Emile Berliner Novem-
ber 17, 1891, for a combined
Telegraph and Telephone,
and controls Letters-Patent
No. 474,231, granted to
Thomas A. Edison May 3,
1892, for a Speaking Tele-
graph, which Patents cover
fundamental inventions and
embrace all forms of micro-
phone transmitters and of
carbon telephones.

DO YOU WANT A LAUNCH?

That you can run
yourself.
That is Clean
and Safe.



That requires
neither Licensed
Engineer nor
Pilot.

Send 10 cent stamp for Illustrated Catalogue of

THE ONLY NAPHTHA LAUNCH.

GAS ENGINE AND POWER COMPANY, 185th St., Morris Heights, New York City.

Bundy Steam Trap.



ARE YOU SAVING ONE DOLLAR A DAY

BY USING A BUNDY RETURN STEAM TRAP? IF NOT, WHY NOT?
THOUSANDS ARE! A. A. GRIFFING IRON CO., New York.
Primer "S" Free.

At 1/4 Price

Bicycles, Watches, Guns, Ruggies, Harness,
Sewing Machines, Organs, Pianos, Sales, Tools,
Scales of all varieties and 1000 other articles.
List free. **CHICAGO SCALE CO., Chicago, Ill.**



KODAKS \$6.00 to \$100.00.

The lightest and most practical cameras for hand
or tripod use. An illustrated manual, free with
every Kodak, tells how to develop and print the
pictures.

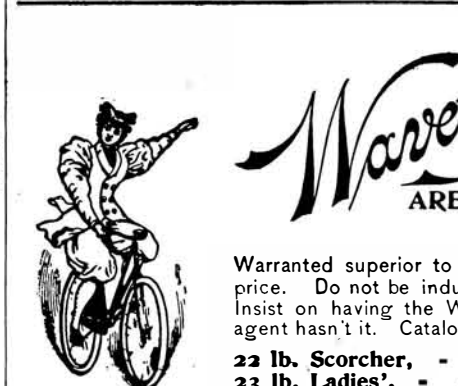
Eastman Kodak Company,
Rochester, N. Y.
Send for Catalogue.

AMATEUR PHOTOGRAPHERS Say That

The Best Blue Print Paper Is Our
FRENCH SATIN JUNIOR.
4x5 per Gross, \$1.00
5x7 " " " 2.00

Does all that silver paper will. Unsurpassed for beauti-
ful definition. Keeping qualities guaranteed for one
year. Money returned if not satisfactory. New Book
on Blue Printing, Sample, and Price List sent Free.
J. C. MILLEN, 923 Arch Street, PHILADELPHIA, PA.

THE NEWSPAPER AND THE ART
of Making It.—An address delivered at Cornell Univer-
sity, by Charles A. Dana, editor of the New York Sun.
Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No.
995. Price 10 cents. To be had at this office and from
all newsdealers.



Waverley BICYCLES.

ARE THE HIGHEST OF ALL HIGH
GRADES.
Warranted superior to any Bicycle built in the world, regardless of
price. Do not be induced to pay more money for an inferior wheel.
Insist on having the Waverley. Can be delivered from factory if
agent hasn't it. Catalogue "1" Free by Mail.

22 lb. Scorcher, - - \$85. **INDIANA BICYCLE CO.,**
23 lb. Ladies', - - 75. **Indianapolis, Ind., U. S. A.**

STERLING BICYCLES

Built like a Watch
The STRONGEST, LIGHTEST, and
FASTEST Bicycles in the World
Elegant Catalogue Free on request.
STERLING CYCLE WORKS,
236-240 Carroll Ave., D 1, CHICAGO.

HIGH-GRADE WHEEL for \$45

One still better
for \$5. Both have wood
rims, pneumatic tires and
all the 1895 latest improve-
ments. 22 to 28 lbs.; strong
and durable. Every
Wheel Guaranteed to
be perfect and as represented or money refunded.
Illustrated and descriptive catalogue M. mailed free
to **MONTGOMERY WARD & CO.,**
111 to 118 Michigan Ave., Chicago.

ICE-BOATS-THEIR CONSTRUCTION
and Management. With working drawings, details, and
directions in full. Four engravings, showing mode of
construction. Views of the two fastest ice-sailing boats
used on the Hudson river in winter. By H. A. Horsfall,
V.E. Contained in SCIENTIFIC AMERICAN SUPPLE-
MENT, 1. The same number also contains the rules and
regulations for the formation of ice-boat clubs, the sail-
ing and management of ice-boats. Price 10 cents.

Green Bone Cutter.

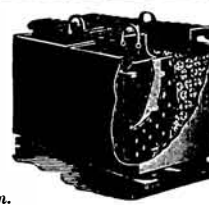
NOTHING ON EARTH WILL MAKE HENS LAY AND
LITTLE CHICKS GROW LIKE GREEN CUT BONE.
Warranted to double Egg Yield
and reduce Grain Bill One-half.
Our Green Bone Cutters are the best on
earth, and the ONLY ones receiving
an Award at the World's Fair.
Send for Catalogues and valuable
article on Feed, free.
WEBSTER & HANNUM, 150 ALBANY ST., CAZENOVIA, N. Y.

**THE ONLY STORAGE BATTERY IN USE IN CENTRAL
STATIONS OF AMERICAN MANUFACTURE.**

THE ELECTRIC STORAGE BATTERY CO.,
Drexel Building, Philadelphia, Pa.

NORLIDE AGGUMULATOR.

TRADE MARK. REGISTERED SEPT. 11, 1894.
Electrical Storage Cells of any Desired Capacity.
Catalogues giving Capacities, Dimensions, Weights, Prices, etc., on application.

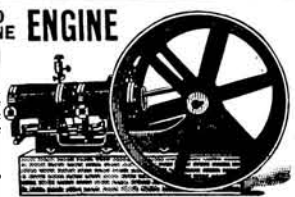


ENGINES, Boilers and Machine Tools. New
"Machinery & Supplies." W. P. Davis, Rochester, N. Y.

EMERY Emery Wheels, Grinding Ma-
chines, and Grinders' Supplies.
Quick process and large stock. When in a hurry,
buy of **THE PATENT CO.** NEW YORK CITY,
CINCINNATI, and STROUDSBURG, PA.

HICKS GAS AND GASOLINE ENGINE

The Long Sought
for Found at Last.
An impulse with
every turn of the
crank. Write
for catal. and prices
Hicks Gas Engine Co.
Permanent Build'g,
CLEVELAND, O.



ELECTRO MOTOR. SIMPLE. HOW TO

make. By G. M. Hopkins.—Description of a small electro
motor devised and constructed with a view to assisting
amateurs to make a motor which might be driven with
advantage by a current derived from a battery, and
which would have sufficient power to operate a foot
lath or any machine requiring not over one man power.
With 11 figures. Contained in SCIENTIFIC AMERICAN
SUPPLEMENT, No. 641. Price 10 cents. To be had at
this office and from all newsdealers.

Nine years with best results, is the
reason why the

OLDS GASOLINE ENGINES

take the lead and have so
great a sale.

Send for Catalogue.
P. F. OLDS & SON,
Box 218, Lansing, Mich., U. S. A.



THE SCIENTIFIC AMERICAN

ESTABLISHED 1845.
The Most Popular Scientific Paper in the World
Only \$3.00 a Year, Including Postage.
Weekly—52 Numbers a Year.

This widely circulated and splendidly illustrated
paper is published weekly. Every number contains six-
teen pages of useful information and a large number of
original engravings of new inventions and discoveries
representing Engineering Works, Steam Machinery,
New Inventions, Novelties in Mechanics, Manufactures,
Chemistry, Electricity, Telegraphy, Photography, Archi-
tecture, Agriculture, Horticulture, Natural History,
etc. Complete list of Patents each week.

Terms of Subscription.—One copy of the SCIEN-
TIFIC AMERICAN will be sent for one year—52 numbers—
postage prepaid, to any subscriber in the United States,
Canada, or Mexico, on receipt of **Three Dollars** by the
publishers; six months, \$1.50; three months, \$1.00.

Clubs.—Special rates for several names, and to Post-
masters. Write for particulars.

The safest way to remit is by Postal Order, Draft, or
Express Money Order. Money carefully placed inside
of envelopes, securely sealed, and correctly addressed,
seldom goes astray, but is at the sender's risk. Address
all letters and make all orders, drafts, etc., payable to
MUNN & CO., 361 Broadway, New York.

THE SCIENTIFIC AMERICAN Supplement

This is a separate and distinct publication from THE
SCIENTIFIC AMERICAN, but is uniform therewith in
size, every number containing sixteen large pages full
of engravings, many of which are taken from foreign
papers and accompanied with translated descriptions.
THE SCIENTIFIC AMERICAN SUPPLEMENT is published
weekly, and includes a very wide range of contents. It
presents the most recent papers by eminent writers in
all the principal departments of Science and the Useful
Arts, embracing Biology, Geology, Mineralogy, Natural
History, Geography, Archaeology, Astronomy, Chemis-
try, Electricity, Light, Heat, Mechanical Engineering,
Steam and Railway Engineering, Mining, Ship Building,
Marine Engineering, Photography, Technology, Manu-
facturing Industries, Sanitary Engineering, Agriculture,
Horticulture, Domestic Economy, Biography, Medicine,
etc. A vast amount of fresh and valuable information
obtainable in no other publication.

The most important Engineering Works, Mechanisms,
and Manufactures at home and abroad are illustrated
and described in the SUPPLEMENT.

Price for the SUPPLEMENT, for the United States,
Canada, and Mexico, \$5.00 a year; or one copy of the
SCIENTIFIC AMERICAN and one copy of the SUPPLE-
MENT, both mailed for one year to one address for \$7.00.
Single copies, 10 cents. Address and remit by postal
order, express money order, or check,

MUNN & CO., 361 Broadway, New York.

Building Edition.

THE SCIENTIFIC AMERICAN ARCHITECTS' AND
BUILDERS' EDITION is issued monthly. \$2.50 a year.
Single copies, 25 cents. Thirty-two large quarto pages,
forming a large and splendid Magazine of Architecture,
richly adorned with elegant plates in colors, and with
other fine engravings; illustrating the most interesting
examples of modern Architectural Construction and
allied subjects.

A special feature is the presentation in each number
of a variety of the latest and best plans for private resi-
dences, city and country, including those of very mod-
erate cost as well as the more expensive. Drawings in
perspective and in color are given, together with Plans,
Descriptions, Locations, Estimated Cost, etc.

The elegance and cheapness of this magnificent work
have won for it the Largest Circulation of any
Architectural publication in the world. Sold by all
newsdealers. \$2.50 a year. Remit to
MUNN & CO., Publishers,
361 Broadway, New York.

Send for Catalogue.
PRINTING
Machinery, Tools,
Inks and Type.
GOLDING & CO., 179 Ft. Hill Sq., Boston, Mass.

PRINTING INKS.

The SCIENTIFIC AMERICAN is printed with CHAS.
BENJ. JOHNSON & CO.'S INK, Tenth and Lombard
Sts., Philadelphia, and 47 Rose St., opp. Duane, New York